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CANADA'S QUETICO PARK

Where Nature reigns unspoiled by man

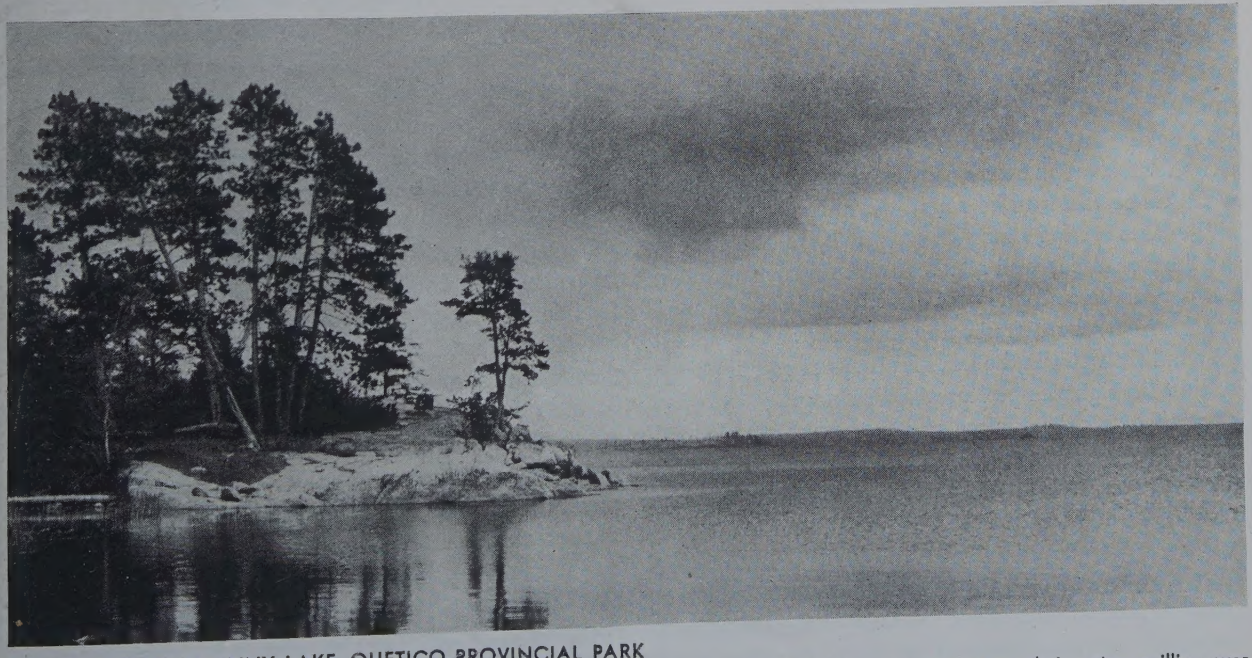
By SAMUEL A. HARPER

Photographs Courtesy of the Canadian National Railway

IN A vast area to the south of Hudson Bay, the ancient rocks of the Archæan mountains, 1,500,000,000 years old, through a long succession of physical and geological changes, have been transformed into a rock-ribbed plateau many thousands of square miles in extent, every basin holding a lake of sparkling transparency, and every hill crowned with primeval forests.

The Province of Ontario has set apart, as a permanent Forest Reserve, a comparatively small area in the southern part of this interesting and beautiful Laurentian plateau, under the name of Quetico Provincial Park. It has an area of 2143 square miles and is approximately seventy miles long and fifty miles wide. Its southern line is the international boundary between the Province of Ontario and the State of Minnesota. Its northern boundary is the right of way of the Canadian National Railway.

The gods have long been at work in this wilderness region, and Quetico Provincial Park is one of the latter-day beneficiaries of their labors. The retreat of the ice at the close of the great period of glaciation in Paleozoic times left this part of Canada much in its present condition, with innumerable lakes, waterfalls and connecting streams. The lakes, in many cases, simply spill over at the lowest point, from one basin into the next below, in much the same way as they did when the retreating ice left them millions of years ago. These rock-bound lakes, streams and waterfalls retain all the pristine grandeur of their ancient glacial days, while the striated hills left bare by the grinding ice have, during the intervening centuries, slowly adorned themselves with primitive forests which have grown and decayed and fallen and grown again, in recurring cycles, through succeeding ages. At last there has been formed a magnificent cover of primeval vegetation untouched and unspoiled by man, matching in its beauty and splendor the original perfection of the crystal lakes and waterfalls bequeathed by the ancient glaciers



PITHERS POINT IN RAINY LAKE, QUETICO PROVINCIAL PARK
This is a land of many sparkling lakes, the heritage of the ancient glaciers, their waters spilling over into some adjoining basin, their borders fringed with beautiful forests

before the forests were born. And so, through the centuries, the long processes of Nature with lake and forest have at last attained a magnificent consummation.

"This is no garden of a day;
This is the lounging-place of God."

And it is of such a wilderness garden as this that Quetico Provincial Park is made.

It is difficult for one to be temperate in one's enthusiasm about this country. The extravagant adjectives of a Rabelais or a writer of travel folders would seem appropriate.

Be that as it may, it is certain that in Quetico Park there is permanently set apart a portion of Nature's loveliness that would be difficult to match anywhere on earth. It has a surpassing charm for the ordinary tourist,

CURTAIN FALLS, RAINY LAKE

The many lakes are so closely joined that canoe trips are easy and most portages only short distances

and for the Nature lover it is a paradise of interest and adventure. With its multitude of lakes, each spilling over its rocky brim into some adjacent basin, the connecting rapids or waterfall usually entails but a short portage from one lake to another, and the entire Park is thus a network of lakes and streams, furnishing the most wonderful canoe routes to be found anywhere.

The lakes are fed almost exclusively by rain and snow, and the moisture is well retained by the dense vegetation that covers the surrounding hills. Throughout the summer, however, short, freshening showers come up almost daily and the water in the lakes is always of crystal purity, and just the right temperature for drinking.

For the geologist, the region is a treasure store of old Laurentian gneiss and granite, with important stretches of greenstones, schists and metamorphosed sedimentary rocks. The shores are sometimes perpendicular cliffs 50 to 300 feet high, laved with black water of corresponding depth. I have trolled for lake trout in 100 feet of water along the base of such a cliff so close to the rock that I could touch it from my seat in the canoe. At other points the shore is a series of rocky ramps or a terrace of giant stone steps extending up the hill and down into the water, with a uniform declination. The water is so transparent that I have sometimes inadvertently walked into it, in coming down these rock steps to the shore. Many of these terraces are the favorite camp sites of guides and forest rangers. Along the lower shore lines, the dark, striated rocks reach out into the water, like giant turtle backs, and these also afford fine camp sites for the wilderness traveler.

For the forest lover, there are magnificent trees of all the well-known northern species. Red, white and jack pine, black and white spruce, balsam-fir, cedar and birch predominate. One of the former Superintendents of the Park in his annual report says: "As an old bushman I must say that I have never seen any timber to equal it." The forests of red and white pine offer the largest and finest specimens of trees in the Park. On the portage out of the south end of Kahshahpiwi Lake I have seen red pines approximately five feet in diameter, and near Sark Lake there are specimens of cedar that I would estimate to be from 800 to 1000 years old. The ranges of black spruce along the hills are especially beautiful.

For the lover of birds and other wildlife, the Park is an out-door museum of rare interest and unusual adventure. Hunting, except with a camera, is prohibited, but many remarkable pictures of moose and smaller animals have been taken. Some of the predatory birds and destructive animals are killed by the forest rangers. Now and then may be seen a tree that is dying at the top. The creature responsible for this damage is the little "porky" who loves the tender bark near the top of the tree. He climbs the tree and clings to the upper branches while biting off the succulent bark, and thereupon the tree withers and ultimately dies. Hence, the rangers shoot him on sight, but porcupines are still plentiful in the Park.

On a canoe trip through the Park last summer, coming down the trail leading to the narrow south bay of Agnes Lake, we surprised a young buck moose with long underslung whiskers. Although we had approached within fifty feet of him, he did not notice us, and after watching him feed for several minutes we finally barked at him to get out of our path, whereupon he lumbered off through the brush with much noise and awkwardness. As we came down to the point of the bay and dropped the canoe into Agnes Lake, we discovered a large timber wolf swimming across the narrow point. He trotted out of the water, shook himself like a dog, raised one fore paw, looked at us a moment, and then leaped away into the forest. Later, on the same trip, we were entertained one night by the howling of wolves, one pack answering the call of another. Breaking the stillness of the forest night, these wolf calls have an ominous and terrifying sound. Although the wolves are not protected, they are still quite plentiful, and

small packs are not infrequently seen on the ice in winter. Red deer are numerous and are often seen drinking at the water's edge, as they are not greatly disturbed by the quietly moving canoe.

Beavers may still be found in many of the smaller lakes, although their numbers have been reduced by illegal trapping. Paddling across Burk Lake last summer I noticed that the shore was fringed with many small dead cedars. My guide told me that they had been "drowned" by the high water created by the beaver dam which had until recently been maintained by the beavers at the head of the lake. These interesting animals are still quite plentiful in the vicinity of Keefer Lake, and at other points in the Park. Minks and weasels are common, but so far as I know there are no muskrats. There is not enough vegetation in these rock-bound lakes to attract this marsh-loving rodent. Except in a few isolated areas, there is little marsh, bog or open muskeg in the Park.

Black bears are numerous, and frequently visit the back door of one's camp in search of food. One day we camped for lunch on a rocky ledge, and the guide in preparing some fish for the meal left the refuse on the rock at the water's edge. We returned to our fishing within sight of the camp and shortly observed a large black bear, sitting back on his haunches, eating the fish scraps. After his meal, he ambled into the water and swam past us to a small island about 200 yards distant.

Of all the wild life in the Park, the birds are probably the most interesting. Here many of the migrants who merely pass in review through the Central States on their long trek to their northern nesting sites, find their permanent summer homes, and sing their rare songs to the unattentive wilderness, or to the ears of the few trail hunters who are so fortunate as to be there and enjoy them.

Among these small migratory birds may be mentioned the hermit, the olive-back and gray-cheeked thrushes, the white-throated sparrow and many of the warblers. Other characteristic birds nesting in this area are the loon, great blue heron, Canada jay, merganser (fish duck), osprey, and bald eagle.

It is generally agreed among ornithologists and bird lovers that the hermit thrush has the finest song of any American bird. Burroughs says: "It suggests a serene, religious beatitude, and expresses a deep and solemn joy which only the finest souls may know." I quote the following from my journal of a canoe trip in Quetico Park:

"Cairn Lake is a beauty, its shores high rocky cliffs, and all the islands single rocks decorated with tall conifers. This lake was to be the high spot of the day, and certainly one of the finest experiences of my journey. As we came down the narrow channel of the lake I heard a hermit thrush singing. We paddled a little closer to the rocky ledge from which the song came and sat there in the canoe, on the calm water, and listened to that marvelous melody for half an hour as it tinkled down to us from the cliff, and echoed out across the water. It sounded as if a little fairy were ringing a cluster of hare bells. The song is of such delicacy, daintiness and spiritual purity that its equal is not known among the birds. To describe it is impossible, to hear it is one of the rare privileges of a lifetime."

The hermit thrush sings only during its mating season, hence its wonderful song can only be heard in the far north where it nests. The hermit loves moss, and uses it in its nest, and along the west shore of Sark Lake, where the forest floor is covered with moss a foot thick, I have heard the hermits sing almost continuously through the day and well into the night.

WILDLIFE ABOUNDS IN THE PARK

A cow moose swims across a little inlet. There is no hunting allowed in the Park save with a camera

The olive-back and gray-cheeked thrushes are more common and more widely distributed. Back of our camp site on Agnes Lake last summer I found a nest of one of these thrushes placed at the juncture of two overlapping branches of two little balsam-fir trees, about seven feet above the ground. The eggs and nests of these two birds are quite similar, and I did not hear the bird sing at the nest, so I am not sure which thrush it was.

I have found the mourning warbler nesting and singing in the Park. He is one of the most beautiful of this large and interesting family of birds. Many other beautiful warblers nest there. The plaintive whistle of the white-throated sparrow may be heard daily, along the wooded shores of all the lakes.

It may be safely said that every lake in Quetico Park has its loon and its merganser. The querulous, questing cry of the former is heard throughout the area, both day and night. In July the mother merganser with a flock of downy young may be found feeding along near the shore of any of the lakes. Game ducks are very rare, probably

because of the absence of wild rice and other duck foods.

There is a nesting colony of great blue herons in one of the bays of Basswood Lake. I have visited the colony a number of times, when there were 150 or more birds, old and half-grown young, flopping about awkwardly among the pine tree tops, and standing, statue-like on the great nests. The whole area is white with guano, and the vegetation all about is ruined by these deposits. My guide and I once came upon a youngster, half-grown and clumsy, slipping and flopping about helplessly along the wet rocks of the shore. We went up to him for a closer view, and the guide reached down to pick him up, but with a flap of his heavy wings against the rocks, he raised his long neck and drove his sharp bill unexpectedly into the guide's forehead, just above the eye. We left the flounderer to his fate.

For some time there has been a movement on foot to set aside a section of Northern Minnesota adjoining Quetico Park, thus making an international park of great beauty. The Quetico-Superior Council has led this drive, thus far unsuccessfully. The outstanding merit of the plan is such, however, that it is still to be hoped that it will meet with success and thus protect a splendid area.

There are no more interesting birds in the Park than the Canada jay, the camp robber who grabs your food as you are about to eat it, and osprey, that king of the feathered fishermen, whose talons are perfect fish traps.

For the fishermen, Quetico Park is the answer to his prayers. I usually fish with barbless hooks, because to keep all one could catch would not only violate the regulations, but would mark one as that most despicable of creatures, the "fish-hog." Wall-eyed pike (called pickerel in the Park laws) are perhaps the most numerous. Lakes like Kawnipi and Basswood furnish as good wall-eye fishing as can be found on the continent. Great northern pike, of large size, are plentiful and large lake trout are frequently taken in some of the deep waters of the Park lakes. I recently caught one in Kahshahpiki Lake that weighed 15 pounds. Few of the larger lakes contain bass, but many small ponds reached by short portages over the hills adjoining the main water courses furnish good bass fishing.

Quetico Provincial Park is a glorious, unsoiled wilderness, crowded with interest and adventure and choked with beauty and charm from the towering Laurentian cliffs that gird its crystal lakes, to the tremulous hare bell that clings to these rocky slopes born of glacial days.

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San Nicolas—The Passing Island

By BRUCE BRYAN

San Nicolas Island, one hundred miles off the southern California coast, is one of Nature's curious freaks. It is encircled by dense beds of kelp that bar all except small boats of shallow draft. Although inhabited by several thousand warlike Indians in prehistoric times, it is today utterly barren. Geologists claim that it is the result of an ancient volcanic upheaval, and that its sand and sandstone are a sublimated form of age-old lava.

Today San Nicolas is about ten miles long and four across at its widest point. Except for a few sparse beds of iceplant and isolated clumps of cactus nothing vegetable exists on its desert surface. Two or three thousand half-wild sheep roam its desolate wastes, the property of a family that rents the island from the government. San Nicolas is reserved by the United States for lighthouse and fortification purposes, although it has never been utilized for either.

Tradition has it that years ago a few trees grew here. Archaeological parties excavating the vast Indian remains strewn over the great sand dunes have dug up dry and rotted stumps. Tons of shells of all varieties, with abalone predominating, glitter in the sun on top of the middens left by the departed aborigines. Constant cross-ocean gales are eternally lashing the exposed island. Terrific sandstorms are an almost daily occurrence.

ON BARREN SAN NICOLAS ISLAND

In the foreground the curious formations made by the winds. The hill in back is an Indian mound

On top of the more or less flat tableland surmounting San Nicolas are weird formations fashioned by the Wind-God. There are curious stalagmitic upcroppings caused by the limestone crust of the plateau being cut into bizarre shapes by the windblown sand-grains. Because it is constantly being blown into the surrounding sea, San Nicolas is known to fishermen and navigators as the "Passing Island." At the extreme east end cross-currents keep building up a great sandspit, but heavy seas tear it down again, and in a few years as geologic periods are calculated, the island will vanish into the waves as did lost Atlantis.

The Golden Bird

By JOHN LINDSAY BLACKFORD

PHOTOGRAPH BY L. W. BROWNELL

THE YELLOW WARBLER AND ITS FAMILY

The little golden meteor will provide delight for its own charm and interest in the brood that it rears

FLASHING from the sunlight into the shade, and back again like an errant sunbeam, the yellow warbler came to our window. It was on a propitious and gladsome morning in early June that this aureate ornament of our woods and hedgerows sought to establish himself as our neighbor. Why was it that he who had been so shy and elusive should now, disregarding my near presence, boldly and gaily pour forth his winsome, sunny song from the shrubbery beneath the casement?

Golden hours come never more appropriately than upon the wings of a bird; and when that harbinger of happiness is "the golden bird," then, truly are they treasured moments of delight. Many such days we anticipated with this sprightly pollen-colored midget threading his bright way through them, and pledged ourselves not to disturb him; yet we found our faces close to the panes much of the time, constantly hoping for a glimpse of him.

"He is looking for a nesting site we told one another hopefully, and then ruefully and accusingly, "you've scared him again, come away." But there he would be in a minute or two, and we could trace his course by the rustle of leaves in the cotoneasters and barberry, although for the most part he flew directly to the spiraea bush beside the window.

He was seemingly in a very fever of excitement, an overwhelming intensity of enthusiasm. Skimming in over the lawn from the verdant woods like a diminutive golden meteor he would presently appear upon a stem within arm's reach. A quick jaunty glance up at us and then, tilting his head, he stood erectly, almost on tiptoe, and vigorously delivered his tinkling notes. How fervent the song, how happy the singer when the little yellow and olive mate could be coaxed as near as the silver birch just a rod away. But her prejudices against the neighborhood were not to be overcome, and usually she preferred to remain among the farther trees.

"Sweet, sweet, sweet, sweetie," he would call to his lady in waiting, *"tsee, tsee tsit-a-wee"* winning us completely, yet persuading her never at all.

But, for a brief interval, the idyllic picture was almost shattered. A second pair of golden warblers, passing in brilliant flight from coppice to coppice, lingered in a clump of wild roses on the lawn. Quite evidently they were charmed. Suddenly, with speed that dazzled, our first visitor was upon his counterpart. And such an undignified scuffle it was! With wings beating, tiny claws scratching, and bills thrusting and nipping, the combatants moved, rough and tumble, across the grass, down the terrace, and out upon the dusty driveway.

Victory, if we could believe our melodious little gladiator, was his; and his notes, when he came darting back to alight upon the green coils of the garden hose, fairly bubbled from his excited, palpitating breast; *"wee-chee, wee-chee, chee, chee, wee-i-u; sweeter, sweeter tsee, tsee."*

"Let's set up a tripod outside and get some pictures of him," I exclaimed, jumping up and running up the stairs after my camera.

"Well, if those other birds out there don't frighten him away you certainly will," came the general response. Accordingly I submitted to what was reasonable, and as a result have no photographs of the militant little lover.

He was there all of the afternoon in the gleaming golden sunshine, tarrying on into the late evening until dusk came creeping from the deeper woods.

It rained in the night, an abrupt, heavy downpour, so that morning dawned with soggy skies and dripping foliage, yet the yellow warbler returned, flying through the mist, and the drip from the eaves, to the spiraea by our

window. Even his optimistic spirit must have been dampened by the change, for all the bushes were bent down with their burden of raindrops, many branches bowed to the ground; water splashed about him from a pool. Nevertheless he came again, and still a third time. Until presently with a cooling breath the rain came rushing, and the downpour continued with drizzle and drip for two days.

Since then, save once, the warblers have remained at a distance, although often we see them flashing brightly among the black birches and the willows. On that occasion our little protégé, I am sure it was he, dashed between the white columns of the porch to alight in the shrubbery beneath the casement. There followed the same sprightly investigation among the cotoneasters and barberry, and the same sunny song from the spiraea bush.

Apparently he was wholly unaware of our disappointment, of how we had thought to build our summer days about his joyous presence there. By his return, however, he had proved it to be no passing fancy.

"If only he had nested there under the window," we said—but then, such disappointments are short lived when there is left to us the right to golden memories.

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Ice Caves Amid Lava Beds

By RICHARD K. KNOX

"Ice Caves." A small sign with this inscription near Winona, Arizona, is all that attracts the tourist to a grotesque but fascinating locality.

After leaving the main highway, US 66, the road gains considerable altitude until it is near the ice caves, where it drops down into a small valley in which are found a river of lava and mountains of volcanic ash on every side. The road has been built across the lava flow and leads to the ice caves. The picture of rugged realism is so complete that one feels an irresistible attraction to press further into this area of desolation. Arriving at the cave, it is discovered that the small entrance has a cold, damp odor issuing from it. There is no telling how deep the caverns are or how far they penetrate. Ice is found present six feet below the surface during the hottest months of the year. It is necessary to crawl and worm one's way back into the caverns as the passages are low, narrow and blocked. The ceilings and walls are covered with ice and the floor with pools of water which hide a treacherous underlying surface of ice. The lava has a strange ability of transmitting sound. Walking on the surface creates a peculiar drumming sound heard in the cavern, which makes one nervous, especially after he has slipped and fallen seven feet into a shallow pool of icy water. Three passages leading out from the first cavern inspire confidence in venturing that far.

ENTRANCE TO AN ICE CAVE

It takes a bit of squeezing to get in but there is room and interest inside

The temperature in the cave averages approximately forty degrees Fahrenheit during the hottest months of the year. On the surface many deep crevices are found from which cool drafts come, seeming to indicate that they are all connected in some subterranean system. Near the entrance to the cave there are present a couple of small volcanic conduits which are perfectly preserved and add much to the picture of the local volcanic activity. Sunset Peak has one hemmed in on the south with its autumnal beauty. I say autumnal beauty because on looking from its base towards the summit you can see the transition of colors from the purplish reds to the golden reds and then into the yellows. This exquisite shading comes from the decomposed products of the volcanic ash. If the tourist takes time and climbs to the top, he will find these colors more beautiful than ever. He may pick up pieces of ash which are red, pink, salmon, yellow, buff, and delicate shades of gray blending into white. Its beauty is enhanced a hundred-fold when the setting sun adds its glow to the already aweing scene. The whole area takes on a charm at sundown that grips the spectator in its spell and long haunts his memory.

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In the July issue of Nature Magazine Ira N. Gabrielson takes us for a hike on the slopes of Mt. Hood, Oregon, and introduces us to the alpine flowers there; Charles Fitzhugh Talman, in another of his weather articles, explodes some still current myths about lightning; Ralph T. Folwell gives us some surprising and entertaining information about black scorpions; Alberta Haden Safford tells the story of a fascinating little titmouse. In the rotogravure section there will be more surprises, including a remarkable set of eagle pictures. In the new conservation section more inspiration to conservationists.

The Truth about Cloudbursts

By CHARLES F. TALMAN

A STREET IN BINGHAM, UTAH

This is how it looked after the waters of a cloudburst flood rushed down the canyon in August, 1930

DEW doesn't fall—except when it drips down from things on which it has previously condensed out of the atmosphere—yet scientific men do not hesitate to refer to the original deposit as "dewfall." Tidal waves have nothing to do with true tides and ought to be called something else, but their popular name has forced itself into the scientific vocabulary. Several other popular misnomers have acquired good standing in the language of science, and one of them is "cloudburst."

The term just mentioned tends, unfortunately, to perpetuate the erroneous idea that clouds sometimes actually burst and discharge their entire water content instantaneously upon the ground. A cloud cannot burst, because it is not, as the learned authorities of long ago supposed, a sort of bag or bladder distended with wind, but a mist of exceedingly minute—almost microscopic—water droplets (or, in some cases, tiny ice crystals) ; and even if it did, for some reason, discharge all its moisture suddenly, the result would not, as a rule, be a particularly heavy downpour.

Clouds contain far less moisture than most people imagine. The densest are probably not more than one part water to 30,000 parts air, and if a huge thundercloud several miles in vertical extent were, by a miracle, suddenly precipitated *en masse* to the ground at the maximum speed of falling rain, the resulting rainfall would be decidedly less intense than often occurs in so-called cloudbursts.

Meteorologists now know that most cloudbursts are merely violent thundershowers. The paradox that an enormous amount of water falls in these showers although, as I have just stated, the clouds overhead contain comparatively little, requires a word of explanation. The most remarkable feature of a thunderstorm is a terrific uprush of air within a limited area at the front of the storm. The vertical blasts in this region carry up a vast amount of water vapor, which cools and condenses rapidly into raindrops, each of them millions of times as big as the tiny droplets that float in the clouds. In still air these drops would fall at once to the ground, but the rising air currents keep them, for a time, aloft; just as these same currents support a bird or an aeroplane soaring beneath a similar cloud. Thus a large quantity of water accumulates at a high level, until a weakening of the upward currents, which often occurs quite suddenly, permits it to fall. This is especially likely to occur when a traveling thunderstorm, which is fed by rising streams of air from overheated ground, passes over the cooler surface of a mountain, where the air has not the same tendency to rise. Thus is explained the special frequency of cloudbursts in mountainous country.

The term "cloudburst" is doubly misleading when it is applied indiscriminately, as it often is, to any and every shower that causes a spectacular short-lived flood in a dry mountainous district. The word conveys the idea of a heavy shower, but a terrific flood may result from rainfall of quite moderate intensity if the water flows down bare slopes and is concentrated by ravines and canyons.

A flood of this sort wiped out a large part of the town of Heppner, Oregon, in June, 1903, causing the death of 200 people. The rainfall causing this flood

THE EFFECTS OF A CLOUDBURST

A house partly buried by a mud flow from a canyon in the mountains of Utah. Photograph courtesy of the U. S. Forest Service

was estimated by J. T. Whistler, of the United States Geological Survey, who conducted an investigation immediately after the storm, to have had an average depth of an inch and a half over an area of 20 square miles. Such a shower would yield more than two million tons of water, and the town was, unfortunately, so situated that a great part of this water swept down upon it in the course of a few minutes. A rain of equal intensity falling on a level surface, or on slopes well covered with vegetation, would have had no serious consequences. This case is probably typical of what happens in a majority of the storms reported as cloudbursts from the mountains of the arid and semiarid western United States.

WHAT A CLOUDBURST CAN DO

Huge boulders, one weighing 300 tons, carried out of Utah canyon by the raging waters

According to scientific definition, a cloudburst is a brief shower of exceptional intensity occurring over a comparatively small area. The extreme intensity of rainfall that can occur in cloudbursts is as much a matter of speculation as is the extreme force of the wind occurring in tornadoes, and in both cases the uncertainty is due to the lack of instrumental records. There are probably not more than forty thousand rain-gauges in the whole world, and only a small fraction of these are of the "autographic" type, designed for measuring, minute by minute, the rate at which the rain comes down. Thus it is a mere accident, and a rare one, if a suitable gauge is placed at just the right spot to record the rate of fall in a cloudburst.

There is an official but probably fabulous report of a cloudburst at West End, Grand Bahama, on April 15, 1931, yielding 24 inches of rain in less than five minutes. Far better authenticated is the record of a shower that occurred on April 5, 1926, at Opid's Camp, about 4500 feet above sea level in the mountains northeast of Los Angeles, California. The little weather station at this place, maintained by the Los Angeles Flood Control Commission, is equipped with a self-registering rain-gauge of recent type, and a second gauge of similar pattern, intended for installation at another station, had been placed temporarily a few feet away when the shower occurred. The greatest rate of rainfall registered by one instrument was 1.03 inches in one minute, while the other showed 0.92 inch during the same minute. The previous "world record" was 2.47 inches in three minutes at Porto Bello, Panama, November 29, 1911.

That decidedly heavier downpours than the two last mentioned sometimes occur is inferred from the great amount of soil-washing sometimes observed after intense showers, not only in hilly or mountainous country, where the flow of the water is concentrated by the effects of slope, but also in comparatively level regions, where huge cavities are made in the ground by the mere impact of the falling water. Observers describe these cavities as resembling, in some cases, the work of the hydraulic "giant" used by gold miners.

The danger of cloudburst floods to motorists and campers in the arid and semi-arid mountainous regions of the western United States needs to be reiterated from time to time. Paradoxically, the danger is greatest in lands where rainfall is rare. Scarcity of rain precludes the growth of the vegetative mantle that, if it existed, would check the rapid surface runoff from occasional heavy thunder showers. Hence, when a so-called cloudburst occurs, the water, concentrated by the slope of the land, rushes in a sudden torrent down the ravines.

Dr. E. W. Shuler, the geologist, has lately described a typical flood of this character witnessed near Fort Davis, Texas. News of the "rise" was received by telephone and a party set off down the canyon in automobiles to watch the coming of the water. "Meanwhile," says the writer, "runners had been sent to warn campers, for, despite repeated warning, the shade of the cottonwood trees and the grassy bottoms along the canyons prove at times irresistible to the transient motorist. Natives of the region, too, who have seen the phenomenon over and over again, are never quite convinced that they cannot 'beat the rise'—most often to their sorrow."

The dip in the road where it crosses the canyon was dry when Dr. Shuler's party arrived. Soon after a hissing tongue of water crossed the road.

"Then", he says, "followed the rising flood, filling the canyon bottom. Downward, tumbling and frothing, now arching up in the middle, then leaping in great bounds, the yellow tiger waters rushed down the canyon and over the road with a mighty roar and pounding of rocks as the waters dragged them along the canyon bottom, or beat them over the concrete slab. It was a fearful sight! *** Three hours later the road and dip were dry."

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As the leading feature article of the July issue of Nature Magazine we are privileged to present a delightful Nature essay from the facile pen of Archibald Rutledge, who needs no introduction to most Nature lovers. It will mark his first appearance in our pages.

Celia Thaxter, Poet of Nature

By M. WILMA STUBBS

Illustration by Jex

CELIA LAIGHTON THAXTER, poet of Nature and the sea, author of *Among the Isles of Shoals,* was born one hundred years ago this June, in Portsmouth, New Hampshire. Her father, merchant and newspaper man, served in the legislature, ran for governor, and, being defeated by means he deemed unfair, forswore forever the world of the mainland. With his family he went to the Isles of Shoals off the Maine and New Hampshire coasts, where he became keeper of White Island Light, although he already owned the islands known as Appledore and Smuttynose and conducted a thriving fishing business on the latter island.

The next six years of Celia's life were spent in the "quaint little old stone cottage" at the foot of the light tower and connected with it by a covered walk. These were the formative years in the poet's life. On the bleak rocks of her island home she entered into the heart of the outdoors; the mystery of sea and sky, sunrise and sunset. She came to know the birds as friends and loved every rock-weed as a living being. Against the background of an unusually happy home, the child was forming that splendid, optimistic outlook upon life which marks all her writing. She was getting, unconsciously, the material for her work. Mrs. Thaxter did not go, and did not have to go, to Greek mythology or Italian art or European folklore for her themes. She found them at her door and therein lies the charm and value of her poetry and her Nature classic.

When Celia was twelve years old, the Laightons moved to Appledore, the largest island in the group. Here, in 1849, Mr. Laighton opened a place for the summer entertainment of guests, the first of the great recreational hotels on the beautiful New England coast. This was carried on by Celia's father and brothers for more than half a century and the opening of it was an event in her life. For here, in later years, were to come many writers, artists and musicians. Here Mrs. Thaxter held "literary court" in the south-easterly parlor of the Thaxter cottage, which became a veritable American "salon."

After Celia's marriage with Levi Thaxter—he had come to the islands as a lay preacher and teacher—her home for a part of the year was on the mainland, in Massachusetts, New Hampshire or Maine. However, so thoroughly grounded are her writings in the large sea atmosphere of the islands she loved with a passionate devotion, that it is not easy to picture her elsewhere. She and the Shoals are one.

Household words are such poems as "Landlocked", "A Summer Day" and "The Sandpiper." But there are many others equally worth knowing. "Landlocked" served Mrs. Thaxter as an introduction to James Russell Lowell, then the editor of the *Atlantic,* where much of her work appeared for nearly forty years. For this magazine the poet Whittier asked her to write her sketches of the Shoals. He wrote: "I wish thee would write out for the *Atlantic* some of the good things thee know of the Shoals and the Shoalers. I have never heard anything equal in dramatic effect to thy stories one evening in the parlor at Appledore."

Mrs. Thaxter's life was a busy one. Until late in life she was not free from everyday household duties and cares. Yet she was always a student and observer of Nature. She read Dante and peeled squash "à la Bronté." During the long illness of her mother, when she was virtually a winter prisoner at the Shoals, she was up at six in the morning to get domestic tasks out of the way that she might have the hours of daylight for painting. Her artistic ability enabled her to provide the illustrations for her last work, *An Island Garden.*

The cultivation of flowers at the Shoals was one of Mrs. Thaxter's greatest joys. People came in scores and hundreds from the mainland to see the jewelled beauty of her flower plots, to which the sea air and the rock-formed soil gave peculiar brilliance. Her enthusiasm in her writing gave a decided impetus to gardening. Here,

too, she showed herself the poet. As a commentary on her poem, "My Hollyhock," we have her brother's words: "Sister's great delight in her flower garden was remarkable, and she would not step on a flower to save her life. I have heard her talk to a group of splendid hollyhocks as though they were alive and could understand her conversation."

Her largeness of nature was shown also in her human relationships, as daughter, wife, mother and friend. Her devotion to her mother appears in the poems, "Impatience", "Her Mirror" and "Compensation", which, in a letter to Bradford Torrey, she states were written after her mother's passing. Her youngest son, Roland, became professor of cryptogamic botany at Harvard, and his children are the inspiration of the poems, "Petition" and "Appeal." Fascinating to a degree are her letters to her friends, unfortunately now out of print.

No lover of the outdoors, of the sea and the birds and the flowers, of Nature in all her manifold fulness, can afford to be unacquainted with Mrs. Thaxter. Being dead, she yet speaketh. And her faith in us is so great. Read "The Secret" and find what she so beautifully says of Nature's secret:

"Her secret? Nay, she speaks to me no word you might not hear.
Her voice is ever ready and her meaning ever clear:
But I love her with such passion that her lightest gesture seems
Divinely beautiful.
She turns her solemn face to me, and lays within my hand
The key that puts her endless wealth for aye at my command;
And in her sweet and awful eyes I gaze till I forget
The troubles that perplex our days, the tumult and the fret.
Oh, would you learn the word of power that lifts, all care above,
The sad soul up to Nature's heart? I answer, It is Love!"

•

Birds Lead Hazardous Lives

By HAMILTON M. LAING

WE ARE apt to feel on watching our wild bird friends that in their nimble command of earth and air they lead well-ordered lives with only their natural enemies to harass them. But, as a matter of fact, these wild folk generally lead hazardous lives and suffer greatly from accident. Death by natural enemy is not accident, it is merely the usual even course of events in Nature.

The evening grosbeak shown herewith met accidental death in trying to dash through a chicken-wire screen. If we investigate the accidents of our birds we will find that the things of civilization are responsible for a great many of them. Of course the ruffed grouse in his meteoric flight occasionally has fatal collision in the woods; many birds often perish in storms, which is accidental death of a sort; the scoter duck gets a gob of barnacles stuck in his throat, or the merganser chokes on his fish; but of every hundred accidents we find, but few are not traceable to man.

The wires strung across the countryside account for the greatest toll of bird life—barbed wire, meshed or netted fence, telephone and telegraph lines alike destructive. Birds often are killed outright; again they have a wing broken to fall prey shortly to some ground predator. Birds small and large meet their fate so—hawks, owls, grouse and ducks alike coming to grief as well as the tiny least sandpiper or sparrow. Many birds meet death during migration at night or in the dusk, yet others, such as grouse that have speed but little nimbleness in sudden turning, drive full tilt into such aerial obstructions even in broad daylight.

Along the coasts the lighthouses have claimed uncounted thousands of small birds from the night flights during migration, certain stations proving particularly deadly. This is accident of wholesale nature, but elsewhere the same is going on in lesser degree. From the tiny hummingbird that gets caught by the neck between two gladiolus stems in the garden to the grebe that alights upon the ice and cannot rise again, or the grackle that in nestbuilding hangs himself with a bit of store cord, the same story is constantly in the telling in the bird world.

A BOUQUET OF LIVING GRASSES

Planting of a bed of ornamental grasses at the National Botanic Garden in Washington. In the center is the giant reed, overtopping other lovely ornamentals that provide a border of beauty in any garden. Below is a dried bouquet of giant reed, the tallest, the richly-colored spikelets of *Pennisetum ruppelii* and a number of stems of *Uniola latifolia* with its interesting broad and flat spikelets. Interestingly enough, this bouquet stands in a vase of grass, a vase made from a section of a great bamboo, a true giant of the grass family, which, in its homeland in the Philippine Islands, grows along some stream and towers heavenward a hundred feet or more

Grass Bouquets

By F. LAMSON-SCRIBNER

Photographs by the Author

THERE are only three families of flowering plants that have a larger number of species than the grass family; none is so numerous in individuals nor more widely distributed. They clothe our vast treeless plains of the West and carpet our lawns and meadows and pastures; they cover the savannas of the tropics, the pampas of South America, the steppes of Russia and Siberia, the veldt of Africa and vast regions in Australia. There are varieties for every kind of soil, every degree of latitude or foot of altitude within the range of flowering plants. While only about 6000 kinds are recognized, in individuals they are as countless as the sands of the sea.

To make possible a clear understanding of this great grass family a classification of its thousands of species, separating them into well defined tribes and genera based upon their individual characters, is necessary. With this classification, easily acquired, we are enabled to "run down" an unknown grass to its proper genus, classifying it in fact. Then the finding of its identity becomes most interesting, imparting, as it will, the pleasurable sense of acquiring knowledge by discovery through personal effort, which is always fascinating.

There is another classification that will appeal more to the average layman. This is the formation of classes or groups based upon their economic value or the interests they chiefly serve. To one of these groups—grasses of horticultural interest—belong those with which fascinating bouquets may be made.

Ever since coming to Washington in 1885, I have been a frequent visitor to the National Botanic Garden, located near the Capitol. Passing through this garden one day early in March before the buds on the leafless trees had shown any sign of swelling and all vegetation seemed

lifeless, I noticed a lot of apparently dead grass tussocks, from which the tops had been removed. These tussocks were arranged within a large elongated oval, the outline of a possible flower bed, located in a grass covered area surrounded by trees. There was nothing visible to suggest the potential agents, no fairy wand that was to change this scene into a living, growing collection of grasses and to become a prominent and attractive feature in the garden during late summer and early autumn months. The collection at this later date was a massed assemblage of a number of our most showy and beautiful, perennial grasses. They made a charming picture suggesting an immense living bouquet—a resemblance emphasized in both the selection and grouping of the varieties it contained.

This planting is typical of beds frequently seen embellishing lawns or decorating open landscapes of well-kept estates. The central and dominant grass in this bouquet is a good stand of the giant reed, its stout leafy stems, ten to fifteen feet high, overtopping all others in the collection. It is related to the cosmopolitan Phragmites or common reed, there are technical differences in the spikelets that serve to separate them. There are two horticultural varieties of giant reed: one with broader foliage, and one with yellow or white-striped leaves.

The dried plumose, panicles often a foot long, are used in dry or winter bouquets. Our photograph shows a bouquet of three of these panicles standing upright in the center, with several nodding bearded spike-like panicles of the graceful and beautiful *Pennisetum ruppelii.* The lower part of this bouquet consists of a mass of the graceful *Uniola latifolia.* The vase itself is a section of a bamboo, a tree-like tropical grass with hollow woody

CLOSE-UP OF THE LIVING BOUQUET

The giant reed, of course, in the background, with young stalks of *Miscanthus* and the broad leaves of *Canna,* as well as other grasses

stems, sixty to a hundred feet, or more, high. This "vase" came from the Philippine Islands and was originally made by the Filipinos for carrying milk.

Giant reed is valued for its tall, leafy, robust stems and large plume-like panicles. It was introduced into this country from southern Europe.

One of the best known of our ornamental grasses is *Eulalia* from southeastern Asia and the islands of the Pacific. It is also called *Miscanthus sinensis.* The several varieties, with plain, striped, and banded leaves, and the form with long and very narrow leaves, were all present in our living bouquet.

About the middle of October I have often seen these cut stems in the push carts of the street venders of flowers in Washington and also in the flower shops of the city. They are valued for dry bouquets, either singly or combined with other grasses.

Miscanthus sinensis, or *Eulalia japonica,* as it was called at one time, is an abundant grass in the Philippine Islands, where its strong, coarse stems are used for making side walls of native houses and for covering floors. Burnt-over areas in the higher districts are taken by this grass to the exclusion of all other vegetation.

There are other grasses in the collection worthy of note. One, the broad leaved *Uniola,* with large, flat spike-

A BOUQUET FREQUENTLY SEEN

Dried *Miscanthus* tops showing the gray, silky, hairy sprays of the fan-shaped panicles. The leaves of this variety are narrow with long tips that curl and twist in drying

lets and nodding highly ornamental panicles. This is a native species frequent in open woods from Pennsylvania southward. It is especially prized for garden culture and for dry winter bouquets. Two species of *Pennisetum* added beauty and charm to our bouquet. The pennisetums are favorite horticultural grasses, especially for border cultures. The heads resemble those of the common foxtails or species of *Setaria*, but differ in having the bristle fall off with the spikelets; in the foxtails the bristles remain on the stem. There are a half dozen or more pennisetums of horticultural interest, often seen cultivated. *Ruppelii* is a particularly handsome species because of the rich coloring of the foliage and long nodding spikes. If cut at the proper season and dried it is valuable for winter bouquets.

A curious and attractive addition to this live bouquet were small beds of ribbon grass that were planted at regular intervals in the border of the main collection. The brilliant white-striped abundant leaves brought these small beds into marked prominence. The spaces between the beds of ribbon grass are filled by some appropriate border plant, the variety being changed each year. In 1932 it was *Achranthus*, while, in 1933, the plant selected was a species of *Cyperus* called umbrella plant. Close to this outer border there were a number of plants of special varieties of canna that added a few striking leaves and a touch of brilliant color to the collection.

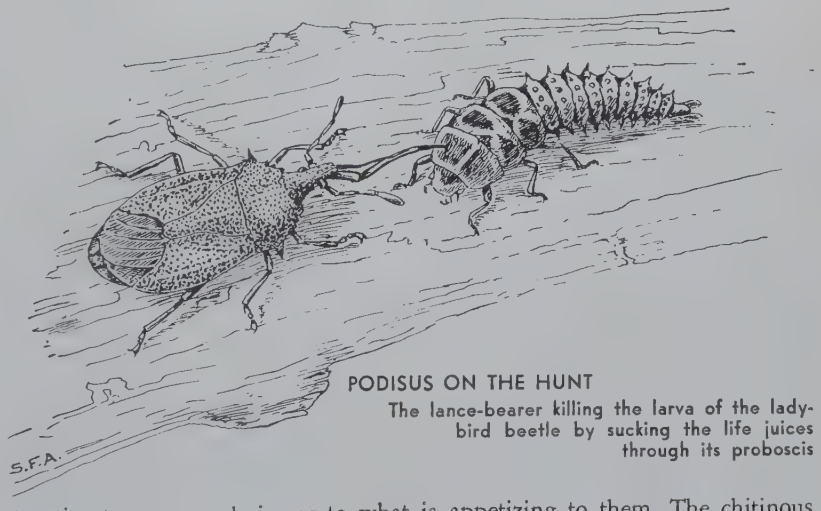
Pleasing color effects are secured in dried bouquets of grasses by adding sprays of the highly colored Chinese lanterns, clusters of bittersweet, branches of honesty and cut selections of so called everlasting flowers.

There are many ornamental grasses besides those found in our living bouquet. A few of similar vigorous growth and showy character, like Indian grass, the common reed, *Phragmites communis*, and, the most prized of all, the Pampas grass of South America. This is the most showy grass among our ornamentals valued for lawn or landscape decoration or in dry bouquets for special occasions.

Grasses are among the most graceful of all plants and although lacking the brilliant colors found in other families they present sufficient variety in color and form to be attractive, are easily propagated and highly decorative in the garden or lawn and when cut and properly dried they are particularly well suited for winter or dry bouquets either by themselves or with immortelles of various colors. They add a touch of refinement to the living room; give cheer to the unfortunate "shut-ins", and, by their delicacy and beauty, pure uplifting happiness to all.

A Valiant Lance Bearer

By S. F. AARON



PODISUS ON THE HUNT
The lance-bearer killing the larva of the lady-bird beetle by sucking the life juices through its proboscis

FEW more intriguing subjects are offered the Nature student than are afforded by the predatory insects. Among them we find the most intrepid hunters and warriors that exist.

Some species are carnivorous only, feeding mostly on insects destructive to vegetation, thus rendering a distinct service to mankind. Among the most useful are the broad-bodied, oval-shaped "soldier bugs", or, as one entomologist has aptly termed them, the "stink-bug" family. They share with nearly all the species of the sub-order a decidedly odoriferous characteristic of such strength as to put the skunk and the green lace-winged flies in the sweet-scented class by comparison.

Podisus is the commonest, technical, generic name, and it may be best used as a common name also for the several species, the meaning being equal feet—the front, middle and hind legs all being nearly alike and about the same length. These bugs fly with precision, though rather weakly. In contrast with their slow motions, the lance-like proboscis is ready at any time to be thrust forward with astonishing quickness. There seems to be little choice as to what is appetizing to them. The chitinous coat of most insects is readily punctured by the lance and the battle is ended when the victim's internal juices are extracted by powerful suction.

While caterpillars of many kinds are the commonest victims, *Podisus* makes prey of anything that crosses its path. It will kill within twenty minutes the predacious larva of the larger ladybug, the tigerish-like grub of *Chrysopa*, the stout-bodied adult black carabid beetle, thus limiting a beneficial character by the destruction of equally useful species.

The proboscis is hinge-jointed and retractile. When extended it is braced by the sucking ligament, adding greatly to the thrust. When the victim ceases to struggle, it is frequently carried about for a time on the elevated lance until all of its delectable internals are imbibed. Often it is considerably larger than the killer.

WHEN YOU
LOOK THROUGH
THE MICROSCOPE

Many things are revealed to the eye by this means, perhaps a strange little creature like the ciliate at the left, or the well-known *Paramecium* at the right

Tracking Microcosmic Giants

By DR. JULIAN D. CORRINGTON

Photographs by Bausch and Lomb

In my neighborhood, as probably in yours, there are no giants still in existence among the visible wild animal population. Gone, fortunately for us, are the sabre-toothed tigers that once snarled across fresh kills at human interlopers. Gone too are the more recently plentiful bison and rare indeed are the opportunities to observe the puma and various bears in their natural state of fearless and wide-roaming liberty.

But it so happens that I, like many of my neighbors, have gone in for microscopy, and own a machine that gives me a magnification ranging from 50 to 300X, and so at any time I wish, I may study to my heart's content a parade of the invisible giants that thrive abundantly all about us.

Size, of course, like everything else, is relative. Animals that we regard today as huge in stature or bulk would be mere pygmies could we take them aboard H. G. Wells' time machine on a journey back into the Mesozoic Age and put them alongside the gigantic reptilian monsters of that far-off day. And who knows but on some other planet there may be creatures now dwelling upon which a dinosaur might crawl as does a flea on a dog!

The particular animals which hold my interest just now live in a world apart, as unconscious of the greater world about them—the world known and inhabited by mankind—as are we of some possible remote sphere of life on a satellite of a distant star. They go their ways, seeking food and avoiding enemies, all oblivious of the harsh fate that next moment may send a wading footfall down upon their cosmos, with instant annihilation to teeming thousands. The Infusoria of our fresh-water ponds and streams fascinate me; but that is scarcely strange, since they have captivated generations of inquiring minds from the day when the invention of the microscope first brought them within our ken.

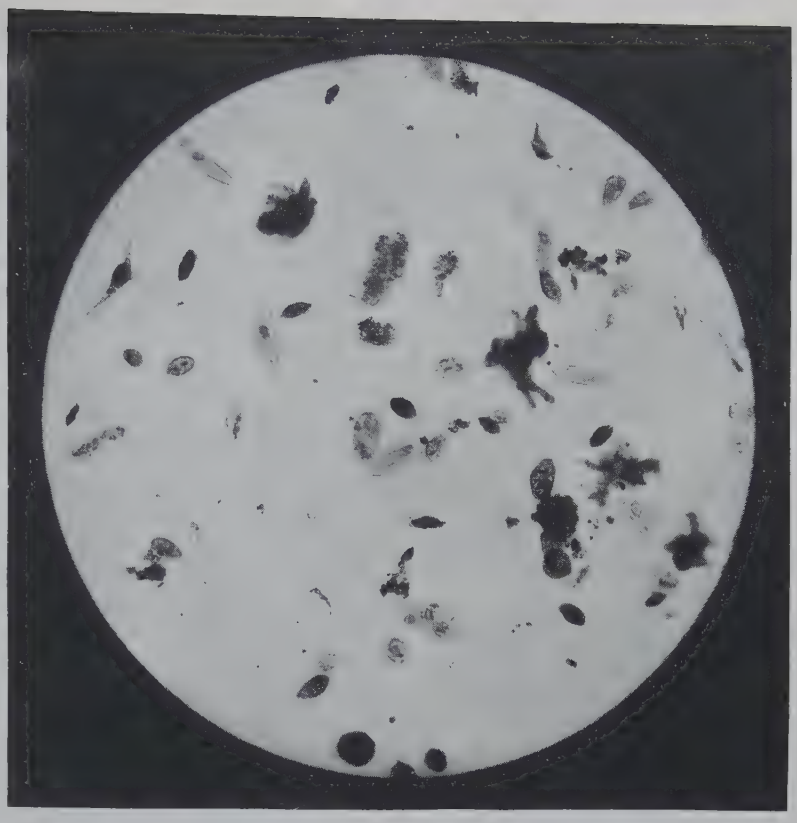
Now, one of the questions my friends are always asking about this wealth of minute life that swarms in a drop or so of stagnant pond water is: How do you tell them apart? What characteristics do they possess by which they may be identified? Well, presence of cilia for locomotion and food-taking is diagnostic for the group, whence the term Ciliates for all save a scanty band of infrequently encountered types forming a separate Subclass, the Suctoria.

Cilia are short but numerous hairs that beat the surrounding water and either drive the animal forward or sweep food particles into the gullet. Kinds and distribution of these tiny propellers then give a basis for further subdivision, five Orders being recognized. The technical names used for these Orders refer to the ciliation, and while there are no English equivalents, it is convenient to anglicize these jawbreakers, whose formidable nature disappears once they are comprehended.

The Order Holotrichida, for example, includes ciliates that are uniformly covered with simple cilia, the name meaning completely ciliated. The best we can do in referring to these little giants with a term even approaching familiarity is to dub them Holotrichs. Most numerous

MANY DIFFERENT PROTOZOA

A prepared micro-slide showing a variety of protozoa. The large, dark and irregular objects are the Amoebae. Most of the others are ciliates



of all Infusorian Orders, a goodly array of these amazing acrobats are certain to be encountered if a wisp of hay is placed in a jar of water and allowed to ferment, creating a hay infusion microcosm, or if samples are collected from stagnant water in ditches, pools or ponds.

Most famous is the Slipper Animalcule, *Paramecium,* for many years a standard study type in all biological courses and the subject of many lengthy researches on general problems of protoplasm, of life and of protozoan organization and behavior.

In this genus the nucleus, as in nearly all ciliates, is represented by two distinct bodies, the large macronucleus having to do with the vegetative or metabolic activities, while the tiny micronucleus concerns itself solely with reproduction. More or less invisible in the living state, staining with diluted iodine or mercurochrome wll bring out these important structures. There is a spiral oral groove that wends a broad and shallow pathway from the front end back to a point just beyond the middle of this animated cell, becoming narrower and deeper as it proceeds. This is the fateful road traveled by *Paramecium's* food, mainly bacteria, tiny cells swept remorselessly onward by long cilia until suddenly plunged into the swirling vortex of the gullet, which descends abruptly into the interior, the hapless victims propelled all the swifter by a vibrating membrane. This structure is really a row of cilia fused together into a rapidly flickering sheet, as if the separate pickets of a fence were to grow into a solid wooden wall.

The position of the mouth opening varies in different Holotrichs, being near the middle of the cell in *Paramecium,* terminal in *Prorodon* and absent in all members of one of the three Suborders. Contractile vacuoles are rhythmically pulsating organelles which fill up with excess water and excretions, move to the exterior and there burst, ridding the cell of these harmful substances. Their number, size and position assist in identification of types. *Paramecium* has two, one in either hand.

Urotricha can hardly be classed as a protozoan giant, being small and oval in shape, but is worthy of inclusion here because of its curious leaping habit. In addition to the regular covering of short cilia, there is a long posterior bristle, resembling a tail, one posterior contractile vacuole and a small terminal mouth opening. Moving slowly forward, this animal ever and anon makes sudden and prodigious leaps to the side, starting forward slowly again from this new location; a very effective means of escaping its minute enemies.

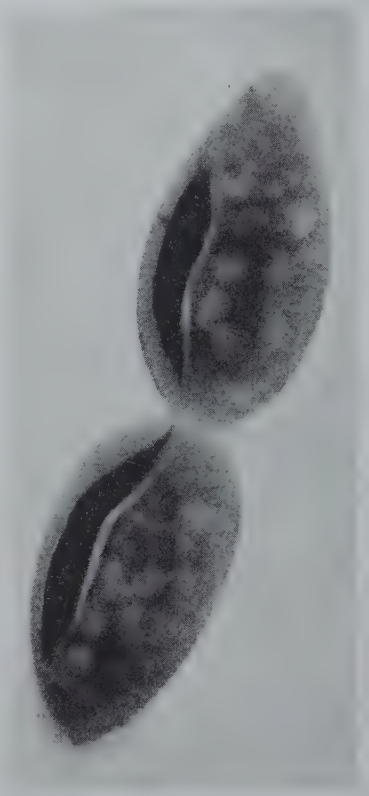
HOME OF THE MICROCOSMIC GIANTS

Underwater view of green algae with drawing of some of the strange looking local inhabitants as they are revealed to those who look through a microscope

Lacrymaria may appear quite small and rounded. But watch it for a moment or so! Suddenly the creature puts forth an immensely long neck, permanently crooked at its forward end, and goes sailing away. The specific name *olor* indicates a fancied resemblance to a swan. *Prorodon* is less than half the length of *Paramecium,* but is more rotund. It has a conspicuous anterior mouth opening and one posterior contractile vacuole.

Comes now *Didinium,* the Paramecium-Tiger, a bit smaller than its victim, but stouter and barrel-shaped. Cilia are confined to an anterior and a posterior belt and since these tiny hairs are most visible where they pass around the sides, at a particular depth of focus they will frequently appear as four tufts, placed somewhat after the fashion of the legs of a higher animal. Combined with an anterior proboscis, the resemblance to a miniature turtle is striking. This fierce little carnivore spells death to the hapless *Paramecium* that strays across its pathway, the anterior mouth opening expanding enormously to engulf the huge prey. The macronucleus is horseshoe-shaped.

Frontonia, met with most frequently in infusions, is somewhat like a *Paramecium,* but averages larger and stouter, with rounded extremities. Contrasting sharply with *Didinium, Frontonia* is a strict vegetarian. *Colpoda* and the related *Colpidium* likewise abound in infusions. They are designed like a kidney bean, with mouth opening on the inner curve toward the forward end, and have one posterior contractile vacuole. Both of these genera are considerably smaller than *Paramecium.* So also is *Pleuronema,* the last holotrich we will have time to mention in this brief survey. An interesting type, this fellow has long cilia and a huge membrane which stands away from the oral groove like a sail. This cell is oval and flattened, with one posterior contractile vacuole.



MICROSCOPIC MARVELS
A picture of Paramecium dividing by fission

Ciliates of the Order Heterotrichida (unlike or diverse cilia) possess a regular ciliation, and in addition certain modifications brought about by rows of cilia fusing side by side, or by clumps of cilia uniting into a tuft or spike. A minimum number of technical terms had best be introduced here, since they greatly simplify our remaining descriptions. The oral groove, as noted in *Paramecium,* is in higher ciliates more often in the form of a circle or oval ring, bordering a funnel-shaped excavation leading to or surrounding the mouth opening, like the rim of a tin funnel. It is consequently designated by the descriptive word *peristome* (around-mouth).

Bordering the peristome on one side only, either in the form of a curved band or sometimes even as a complete circle, is the *adoral zone* (beside-mouth) composed of a row of *membranelles,* which are thin flags of cilia. Often these membranelles are so fine that they may appear simply as rather larger and longer cilia, but extremely high powered microscopes reveal their compound nature. If one imagines the lips of a man's mouth to represent the peristome, then the mustache is the adoral zone and each hair of this facial adornment is a membranelle. Reference to one of the illustrations will serve to clarify these points.

Heterotrichs include giants indeed. One of them, *Spirostomum,* may reach the unbelievable length for a protozoan of 2 mm. when fully extended! They have the capacity of contracting into a short spiral, but when in the form of elongate cylinders are easily visible to the naked eye, especially if present in numbers. Look for them in cedar bogs. The adoral zone is very long and the macronucleus is in the form of a chain of beads extending more than half the length of the cell.

The fine covering of unmodified cilia all over the body is seen to advantage in that goliath of the microcosm, *Stentor,* various species of which are not infrequent in cultures taken from standing fresh water in the vicinity of aquatic vegetation. *Stentor cöeruleus* is unusual among ciliates in possessing color, being blue. You may observe these Heterotrichs as thimble-shaped organisms swimming freely through the water, or as long trumpets, with the small basal end attached to some bit of flotsam. Animals anchored in this fashion are termed *sessile,* an estate not infrequent among the wielders of cilia.

Bursaria reaches a length of over a half a millimeter, and is oval, with a truncated anterior end. There is a deep peristome running from the forward end to beyond the middle, and the macronucleus is a long band, frequently curved.

In the Order Oligotrichida, most of which are parasitic, there is an adoral zone in the form of a complete ring, but elsewhere cilia are not abundant. *Halteria* is the only Oligotrich likely to be encountered in the pond water culture, and in addition to the anterior adoral zone, displays a ring of long *cirri,* representing fused cilia, which enable this small species to perform astonishing springing movements.

The Hypotrichida includes two genera of more than passing interest. In this group the animals are flattened from top to bottom, with cilia and large cirri confined to the lower surface and to a prominent adoral zone.

Stylonychia are ubiquitous in distribution and vastly intriguing to study. In size, they vary from the dimensions of a *Paramecium* to half as large, and the usual three posterior cirri are a distinguishing feature. They often run about over other objects (Continued on page 342)

We have heard much about the wisdom of the owl and how he ponders while he sits, seemingly asleep, on some arboreal perch. Perhaps we may be permitted the feeling that this particular owl is especially wise in view of his early choice of reading matter. Photograph by Lorene Squire.

Any time is mealtime in the nest of the chestnut-sided warbler. Here we have graphic evidence of the value of our song-birds in controlling insects. Father Warbler is bringing one of many insects provided the hungry brood in the course of one day. Photograph by Lynwood M. Chace.

Mealtime in Birdland

PHOTOGRAPHED BY L. W. BROWNELL

First comes the exciting time of the arrival and nest-building of our song-birds, and, soon, downy hungry offspring tenant these nests. Ever fascinating it is to watch the parent birds satisfying youthful hunger, whether in the nest or after the youngsters are making their first ventures into the world. It is a time of drama, humor and hope.

Above, the phoebe pokes a meal into the bill of one baby bird while the others seem to join in a duet of hungry remarks. At the left, the spotted sandpiper returns to its nest on the ground to make sure that all is well. Below, the brown thrasher mother is anxious that nothing shall be lost and rams a meal effectively into the baby.

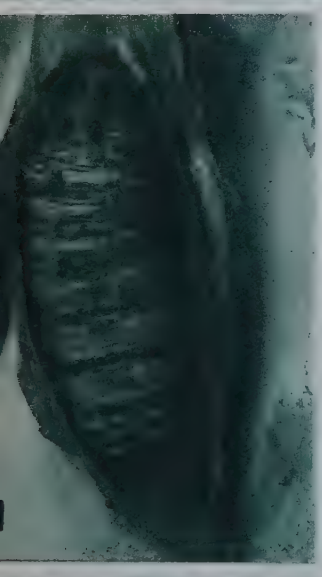
Clinging to a stem, the blue-winged warbler above takes a point of vantage for the feeding of its baby. Above at the right, a tragedy of birdland. In the nest of a yellow warbler the cowbird has laid an egg, and the little mother of the nest is attempting to satisfy the voracious demands of this big, hulking baby that has forced her own children out of the nest and still demands attention from its foster parents. Pictured at the right, the youthful flickers are waiting at the door for lunch and vying with one another for the first serving. Photograph by R. A. Romanes. Below is a group of young lark buntings in the nest acting hungrily expectant although the parent bird does not seem prepared to satisfy them. This is Colorado's State bird.

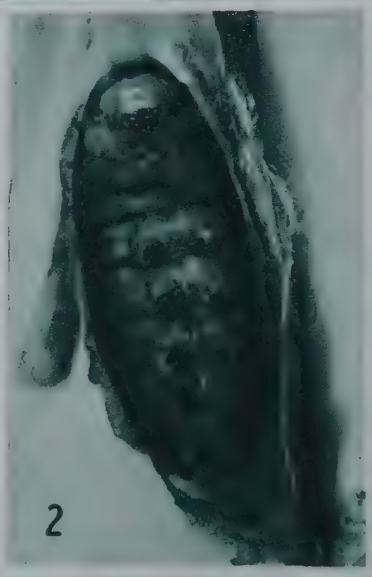
Surrounded by a family of fuzzy, sand-colored youngsters, the male spotted sandpiper carries on with his family duties. In many, perhaps in most instances, the father bird incubates the eggs and takes care of the proper feeding and early upbringing of the young of the family. Photograph by Alfred O. Gross.

Below is the interesting, cave-like nest of the ovenbird. Within, a hungry brood awaits dinner. Startled, but not driven away from her important duty of taking care of her young, the parent bird pauses to see what the click of the camera shutter really means. Photograph by L. W. Brownell.

Looking across the smooth expanse of Jackson Lake at Mount Moran and the Teton Range. It is into those mountains that the Nature Magazine party of trail riders will go in August to spend a week camping, riding and hiking away from civilization. Photograph courtesy of the Union Pacific.

Two pictures of interesting friendships. Above, a fawn and a cat that played on the slopes of Mount St. Helena in California. The fawn was found motherless, the doe probably being the victim of some lawless hunter. The youngster grew up as a close friend of the cat, ducks, and chickens on the place until it was able to care for itself. Photograph by I. C. Adams. At the right is an interesting and firm friendship between a collie and a fawn, the collie appearing a bit self-conscious about it all.

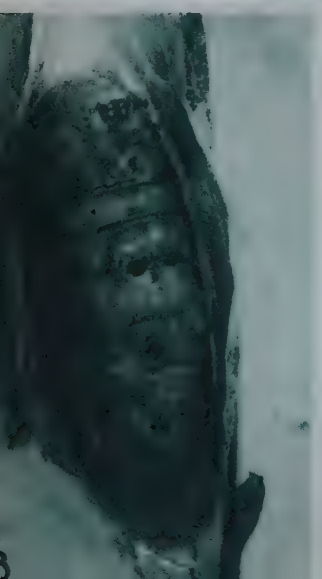


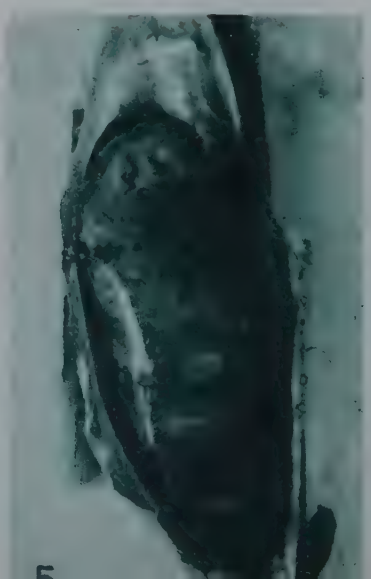


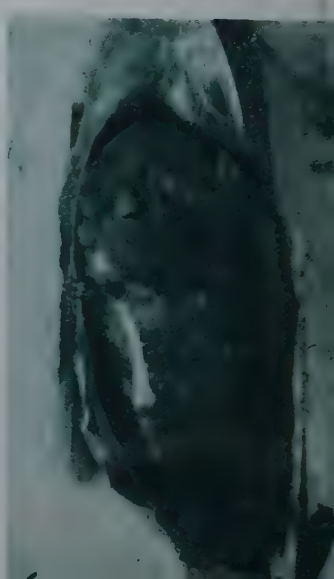
Larva to Pupa

Ever fascinating are the stages of transformation in insect life, the most widely observed being the final emergence of the moth or butterfly from the cocoon. Frank Lewis Marsh, however, determined to record in pictures the change from larva to pupa in the cecropia moth. Above we see the larva of this insect and, at the top of the opposite page, the adult moth.

The drama of the transformation is indicated by Mr. Marsh's series of twelve pictures. The spinning of the cocoon takes from three to eight days, after which the larva rests for a few days, while the skin becomes dead in appearance and quite transparent. In the first two pictures we see the dorsal and ventral view of the larva,

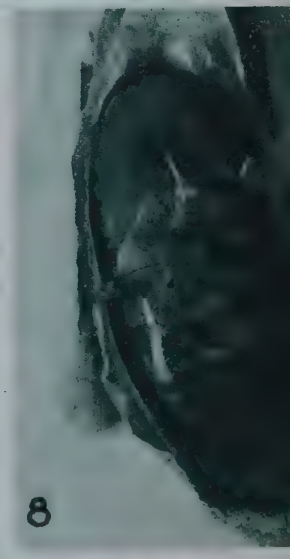


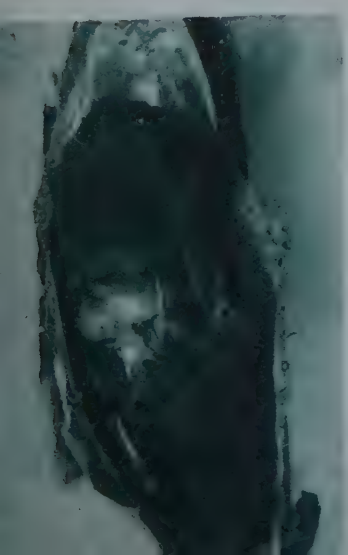


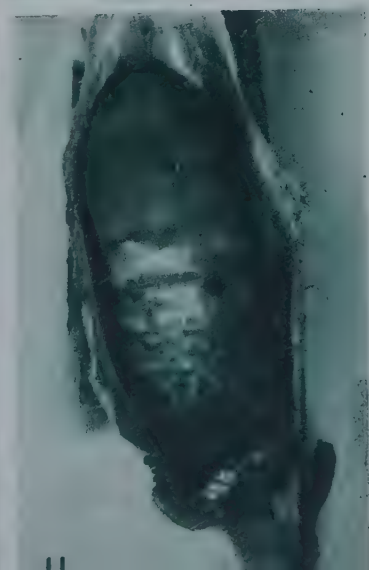


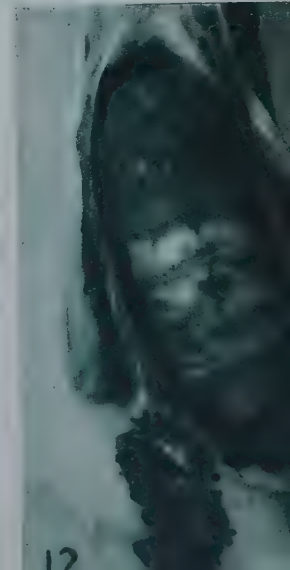
and in the succeeding ten pictures the change to the pupa, which took eight minutes.

First there are waves of contraction at the posterior end of the larva; the skin stretches and a white streak appears where the strain is exerted. Rupture soon occurs along this line and the skin is rapidly worked down. When this change takes place normally, in the seclusion of the cocoon, the discarded skin is compressed into a compact little pellet. The freshly-shed skin may be inflated into a good likeness of the larva. In pictures eleven and twelve the skin of the larva is practically shed and, then, finally, entirely shed (shown outside the opened cocoon). At this stage, under normal conditions, the pupa settles down to wait until it is time to emerge as the colorful and attractive adult moth shown above.









Tropics in the Nation's Capital

Photographs by F. Lamson-Scribner

Many are the attractions of the Nation's Capital, and one of the more recent is the beautiful new Botanic Garden where the visitor can step into the midst of tropic beauty and luxuriant growth such as that shown at the left. In the foreground fancy-leaved *Caladium*, and branches of *Angiopteris* enter the picture at both the right and the left. In the background are palms from tropical climes growing successfully in the temperature of the garden.

The fern room, below, is filled with many beautiful plants. The large fern in the rear center is the *Angiopteris*, and the broad-fronded fern is the "bird's nest" fern from Eastern Asia.

Other notable and beautiful ferns from many parts of the world make this room a place of beauty, of color and growth, the graceful formations of these plants and their varied shades of green combining into a delightful botanical picture.

As one wanders through the tessellated paths of the National Botanic Garden he encounters such spots as that at the left. Here palms from tropical America, Australia and Asia grow among various smaller plants from the jungles of Equatorial regions.

Pictured below is a beautiful specimen of *Angiopteris evecta* in the center, with *Cycas circinalis*, the so-called "fern-palm" at its right. These interesting plants are relics of the "Age of Cycads," and are intermediate between flowering plants and cryptogams. The existing species are tropical, but are well-known in cultivation in this country.

Three more National Botanic Garden views. Above a lily pool surrounded by fancy-leaved *Caladium* against a background of varied luxuriant growth. At the right is a rock garden scene in which a beautiful plant of cinnamon fern is most prominent. Below we see an exterior view of the Garden with a lovely planting of decorative grasses. This reveals only a corner of the large building which holds so many botanical treasures and which should be visited by every American who visits the Capital.

Exploring Jungle Lands

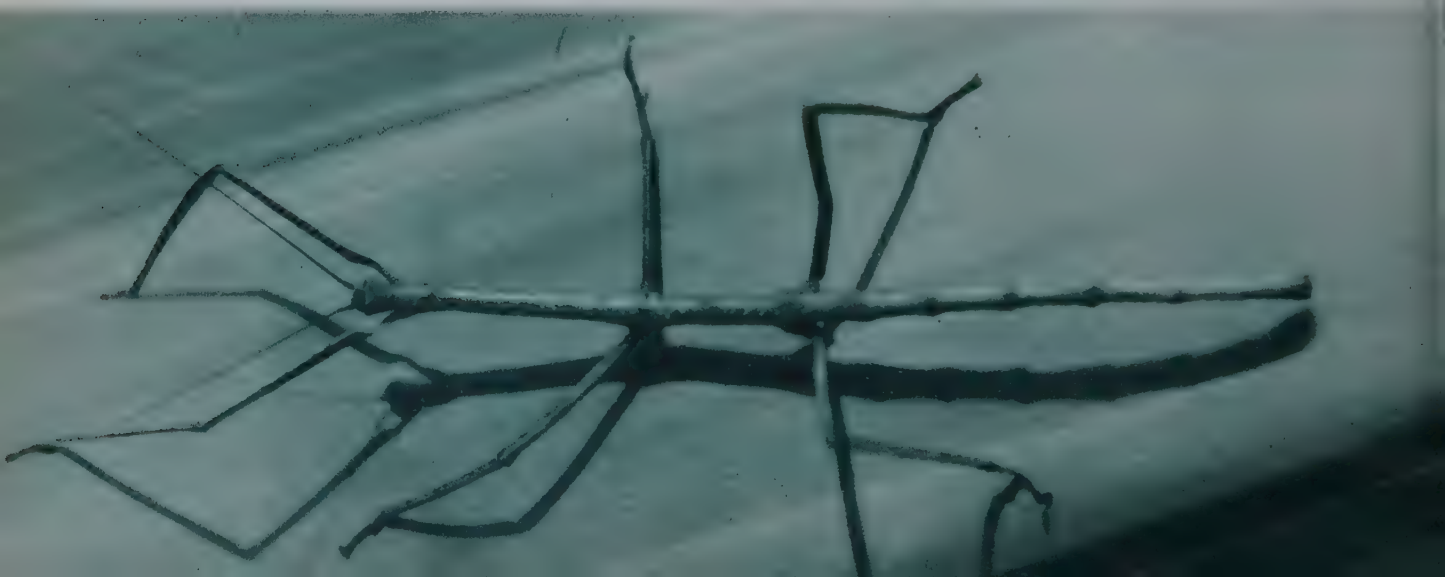
Photographs Copyright William LaVarre, from Gendreau, N. Y.

Let someone voice a demand for something from somewhere and William LaVarre is ready to organize an expedition to find it. He is by profession an explorer. Better, perhaps, that is his business, for he conducts his expeditions to discover and to bring back, if possible, things demanded by industry—a medicinal plant for a pharmaceutical firm, perhaps; or a parasite that kills the corn-borer; or title to a concession of sarsaparilla trees; or a shipment of balata gum. He has thus explored profitably for commerce and, at the same time, satisfied a boyhood urge to penetrate into the far places and the unknown.

The pictures on these pages were taken in the course of the LaVarre Brazil-Guiana Expedition. They reveal Mr. LaVarre's interest in the wild life of the various regions he visits. One member of his party is always Mrs. LaVarre, who contributes both charm and ability to the expedition. In the picture above Mrs. LaVarre is caught by the camera in the course of a serious interview with a young Jabiru stork that is, perhaps, protesting against having been rudely removed from its home in a high cotton tree.

The Adjutant-storks and Jabirus are the largest members of the stork tribe, and the most unlovely, the American Jabiru being among the more attractive of all this group. The plumage of the grown bird is a pure white, the upper parts having a satin-like gloss. This whiteness is well set off by the jet-black head, neck, bill and feet.

The leader of the expedition, Mr. William LaVarre, provides a meal for two of the birds with which the party made friends. The macaw perched on his arm gets special service and feeds out of a spoon, while the pelican prepares his capacious bill, expectantly awaiting similar attention. In the course of his explorations, Mr. LaVarre has brought back many specimens for zoos and museums. Below is a strange yet common insect in the Amazon district of South America. This is a giant walking stick that resembles nothing more than a twig of a tree when it is at rest. We have similar but smaller species in North America. Note the appearance of bark and the suggestion of twig joints on its body. On the facing page at the top is the "death flower" photographed in the act of trapping a bee by closing its inner "petals" around its prey. Below is the Victoria water lily.



A mother three-toed sloth, her baby clinging to her back, reaches out for a limb to swing them both to another vantage point. Below, the photographer catches a somewhat smug closeup of a sloth. Almost the entire life of this animal is spent among the highest trees of the dense South American forests. The sloth walks suspended beneath the boughs of the trees instead of balanced above them. It takes its slumber in the same position. While thus sleeping the animal looks much like a pendant bunch of lichens, thus being protected from its enemies. It is nocturnal, spending its days in repose and foraging for food at night.

There seems always to be a sadness in the look of a sloth, but in reality it leads an enjoyable and deliberate existence. Its strange manner of moving about in its natural habitat has made opposable fingers and toes unnecessary, and they are reduced in number, and are enclosed in furred skin down to the powerful claws.

★ Conservation ★

A section of Nature Magazine devoted each month to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

ARTHUR NEWTON PACK, *Editor*

TESTS FOR HUNTING LICENSES ★

Attempts have been made by law and regulation to give special protection to certain species of waterfowl. The wisdom of such provisions has been questioned on the ground that hunters cannot distinguish the forms concerned, especially in flight, and progressive protective measures have actually been abandoned for this reason. Thus the benefit of doubt has been given to hunters instead of to the birds, a move which, considering the urgent need of waterfowl for protection, is in precisely the wrong direction.

It can legitimately be asked, however, whether hunters who cannot recognize the game they are seeking have any right to be afield. Their deeds emphasize the justice of this query especially in such extreme but nevertheless frequent instances of the shooting of calves, colts or even men in mistake for deer. Among the waterfowl group, swans, supposedly entirely protected since 1918, have been shot by lubbers who thought they were geese. There has been no open season on the wood duck for the past sixteen years, but hundreds of individuals of the species, none the less, have been killed. The usual excuse when such cases are detected is "I didn't know . . ." and it is, as a rule, considered sufficient by courts not interested in conservation.

That such ignorance does prevail is proof of deterioration in the qualifications of our hunters. The old-time gunner who lived in the open as much as possible, because it was in his very nature to do so, knew the game. He could recognize species of ducks not only as they flew by at ordinary ranges but at distances where they appeared only as specks against the blue. He would laugh to scorn the suggestion that hunters cannot learn to distinguish, on the water or in the air, any and all of the varieties of waterfowl.

The trouble is that nowadays we have a mob of faddist gunners who cannot take care of themselves outdoors, who scarcely can be trusted with firearms, and who know next to nothing about the game of which they are in quest. The condition exists, but that does not make it right, or necessarily to be accepted.

The general and, in many cases, swift diminution in the numbers of game species renders inevitable the conclusion that hunting, and therefore the number of hunters, must decrease. Mere drifting with the current of custom and events has brought about some reduction in the number of gunners, largely based on financial ability. Non-resident license fees and club membership dues may be cited as factors causing a certain degree of reduction in hunter numbers. Class distinction, however, is evident and has been severely criticized.

Since diminution of the sportsman population and an equitable method of causing it are highly desirable, and elimination of the uninformed gunner is a necessity to conservation, why not achieve all of these objects at one step by examination of candidates for hunting licenses? Let the burden of proof be on the applicant; let him show beyond doubt that he does know enough about game species so that he can obey the law. Such a requirement seems entirely reasonable and just. Enforcement of it, however, would take probably nine out of ten of the present gunning population out of the field. Some could learn enough to pass the test; others could not. There would result not only the much needed reduction in number of hunters, but also such highly desirable things as better and safer behavior out of doors and a more sportsmanlike attitude toward all living things.

★

SELLING THE UNPOSSESSED ★

One of the principal benefits of the Migratory Bird Treaty Act and Regulations of 1918 was the abolition of market shooting. It was thought then that the commercialization of any wild game was a threat to its existence—so hunting for the market was prohibited. If we were right then, we are wrong now, for we have permitted the growth and firm establishment of another form of exploitation of wildfowl for private gain—namely, by purveyors of hunting. This gentry includes a great variety of guides, boatmen, and duck tenders, as

well as proprietors of shooting lodges, game preserves (save the mark!) and commercial duck "clubs".

In banning the market hunter, we tried to prevent shooting for sale, but while reflecting smugly on that achievement, we have seen built up a system of sale for shooting that is a far greater menace to wildfowl.

The system runs the gamut from comparative decency (as decency goes under our rules for legalized extermination) to enormous and ruthless abuse. Among such abuses are duck pens where no duck that comes is out of range, and worse, duck trenches where narrowly confined birds are shot *en masse* on the water. Massacre is the only word for slaughter of birds thus lured to their doom by heavy baiting. In some places, desert lands are made into ducking grounds by flooding and baiting, both of which practices are abruptly discontinued at the end of the shooting season. Some duck clubs guarantee the legal bag limit of ducks, making up deficits from a jackpot of birds shot by employees. Some are so managed that several "limits" can be bagged in a day from a single shooting stand.

The "commodity" in which these destructive establishments deal is the favorable opportunity, even certainty, of shooting wildfowl, hardly a step removed from sale of the birds themselves, and even that step bridged where the bag is guaranteed. Thus again we have sales, which once we so virtuously prohibited. The sale, moreover, is of something that does not belong to the individuals and organizations purveying it. That "something," furthermore, can hardly be said to be the property even of the nation that permits its exploitation for it is produced very largely by another country. If a band of sheep strayed across the border, it would be protected from molestation, but a flock of wildfowl, that is something else.

If possession is nine points in the law, how can it be lawful to sell the unpossessed?

★

THE NO-SHOOTING CROWD ★

Genuine conservationists are often referred to by sportsmen as a bunch of old maids and sissies, or as long-haired men and short-haired women—in other words, as an abnormal and unbalanced lot entirely unqualified to have anything to do with game protection—strictly an affair of the only real he-men and red-blooded citizens—the sportsmen. The conservationists are usually spoken of as the "no-shooting crowd" and anything to discredit or "lick" them is considered very laudable.

If it were only possible to divert some of the good red blood of the gunners to their brains, they might well begin to doubt as to which group, their own or the conservationists, is the real "no-shooting crowd." Sportsmen have always had control of game affairs in this country almost to the total exclusion of real conservationists, with the result that practically everywhere game, that is, animals killed for fun, have steadily decreased in numbers. The process has aptly been called one of legalized extermination and its results to date, as the sportsmen claim (scarcely realizing what they are claiming), must be credited chiefly to them.

Despite deplorable conditions patent to every lover of wildlife, genuine conservationists have but rarely insisted on complete protection. Rather they have avoided controversy over the sportsmen's claim as to the right to take game, and while recognizing that claim have tried to guard against the extermination of species.

Nevertheless sportsmen as a class have not admitted the possibility of extermination despite the fact that certain exterminations have occurred and others are threateningly imminent. They have merely wanted to go on as they have in the past with the minimum of disturbance to what they are pleased to term a right—namely, the killing of other living creatures for fun.

The so-called constructive endeavors for which they claim so much have been ineffective except under local and usually peculiar conditions, the continuance of which cannot safely be assumed. Such efforts are puny compared to the large scale operations of Nature which are essential to wildlife preservation. Only by permitting Nature to operate freely and without too much counteraction can the fauna of the continent be preserved on anything like a satisfactory scale. Conservationists have always urged the assured preservation of worth while samples of our wildlife under natural conditions. They have been tolerant, to a surprising degree, of conflicting practices of the sportsmen group.

Despite the pleas of conservationists, open seasons are increased when the species involved are known to be dangerously decreasing in numbers, hunting is permitted of animals near the point of extermination, refuges have been thrown open to hunting, wild creatures driven from refuges so that sportsmen might shoot them, and game laws dictated by the sportsmen themselves almost universally violated and ignored. The cry of sportsmen is not, as it should be, "We will cooperate in securing obedience to law," but, "How are you going to enforce the laws? How are you going to catch us if we do violate them?"

So the game of legalized extermination goes on. Everyone knows it. Conservationists, the so-called "no-shooting crowd," sorrowfully recognize it and are doing what reasonable beings having such knowledge would be expected to do. Sportsmen should, and in many cases undoubtedly do, realize it but they are unable or unwilling to stem the tide of destruction. Unless that tide is stemmed, however, many more of our wonderful wild creatures will be added to the list of those extinct or nearing extinction. They will cease to be game as a result of destructive policies and practices insisted upon by sportsmen. Ironically enough, therefore, it seems that in continuing to kill when game almost everywhere is steadily diminishing, gunners by their own actions and policies are surely and not slowly becoming a "no-shooting crowd."

THE BLACK BEAR NEEDS AND DESERVES GREATER PROTECTION

Unless it is given consideration throughout the country, this American mammal is likely gradually to decline to the point where it will join the growing group of extinct species

The Truth About the Black Bear

By LEO A. LUTTRINGER, JR.

WHAT is the present status of the black bear? Are these splendid big game creatures increasing or decreasing? In an effort to determine the answer to this important question the writer made a nationwide survey of the black bear situation. Reports from most of the states harboring these animals lead one to believe they are on the increase. This is good news—in fact, I am afraid, a little too good. I say this not sarcastically, nor do I discredit the reports of those officials who so generously made possible the following notes. Personally, however, I am inclined to believe, after a thorough summing up of the situation, that unless more rigid protection is given the black bear we will soon no longer enjoy his presence. He will soon be heading the same way old Silver-tip the grizzly is headed.

The grizzly is probably doomed. Statistics in the U. S. Forest Service show a noticeable decrease in their numbers during the past few years. We do not want the black bear, so picturesque in appearance, so grotesque in habits and so interesting a part of our wildlife resources to go the same way.

I firmly believe most state conservation departments are doing everything within their power to protect and perpetuate this noble creature. The trouble is that few of them get anywhere because of unsympathetic legislation, lack of funds, and numerous other obstacles, political or otherwise.

The greatest bear State in the Union, though one of the smaller and more thickly populated, is Pennsylvania. It is not my purpose to discriminate, but there is no doubt whatever that to this Commonwealth belongs the credit for having given Bruin his first opportunity.

Pennsylvania was the first State to protect the black bear, in 1905. Subsequently traps, pens and deadfalls were outlawed, and in 1925 cubs were protected. The first season began in 1905 with an unlimited bag and a six months open season. These same regulations remained in force until 1915 when a limit of one bear per individual was established and the season was reduced to two months. In 1917 a camp limit of three was established. In 1921 the season was shortened to a month and a half, and the following year the camp limit was increased to four. In 1925 the season was again reduced (November 10-December 15), and in 1926 from November 16 to December 15. In 1928 bears were hunted the last three days of each week during November and six days a week from December 1 to December 15. In 1929 the season was lengthened again to a month and a half where it remained two years. In 1931 the November 10-December 15 season was again declared. In 1932 the camp limit was reduced to three and the season cut to November 10 to November 30, the same also being effective during 1933.

During 1933, however, Pennsylvania officials, alarmed by reports from all field officers and interested sportsmen in the bear territory, conducted for some months an intensive and thorough survey of the bear situation and found conditions such that it was deemed wise to close the season for one year at least. Thus the bear season was closed last year in Pennsylvania, the first time since their protection twenty-nine years ago.

Pennsylvania game officials further claimed that the 1933 season was particularly hard on the bear population for several other reasons. In the first place, all the conditions that go to make up a good bear season were unusually favorable for a big kill. Weather conditions were ideal in most of the bear territory, and a good tracking snow contributed the last desideratum for successful hunting. As a result, 586 bears were killed—possibly half, or at least a third, of the entire bear population.

Another factor limiting the bear increase—even though unintentionally—were the C. C. C. camps in bear territory. The presence and operations of these large numbers

of men in territory usually undisturbed by sight or sound of men except during the hunting season undoubtedly in many instances frightened hibernating mother bears from their dens, leaving cubs to starve; possibly to some extent even preventing breeding.

The Pennsylvania Game Commission requires hunters to report all game killed on a stub attached to their hunting licenses, and through this system an accurate check has been maintained. Since 1915 the following number were taken: 1915, 188; 1916, 435; 1917, 368; 1918, 387; 1919, 472; 1920, 420; 1921, 510; 1922, 563; 1923, 500; 1924, 929; 1925, 470; 1926, 660; 1927, 321; 1928, 427; 1929, 447; 1930, 707; 1931, 501; 1932, 216; and 1933, 586.

According to reports Pennsylvania hunters have killed some unusually large bears. Two on record weighed 639 and 650 pounds respectively. Few are taken that weigh over 400 pounds, although many weighing 200 to 300 are killed.

Unlimited in power, the Pennsylvania Game Commission can regulate the seasons and bag limits without legislative action and therefore can more efficiently keep check on the game supply. Furthermore they have their own revenue which is placed in a special fund, known as the Game Fund. Not one cent comes out of the taxpayer's pocket; all of it is contributed by the hunters themselves through the purchase of their licenses. Still further, Pennsylvania has the most powerful organized group of sportsmen in the country, more than 700 active sportsmen's associations.

THE AWKWARD BEAR CUB

Many are trapped to be sold into durance vile in some roadside zoo, against which there should be regulation

A résumé of some of the other state reports will, no doubt, prove interesting.

Florida officials advise that the bear has no legal protection and it is hard to determine just whether he is on the increase or decrease, as they have no record of the kill for the past several years. They advocate legislation for the protection of bear, but cannot say just when it will go through.

New Hampshire gives the bear no protection either, although attempts have been made to do so during the last three sessions of legislature. They were unsuccessful except in 1933, when only a six-week open season was allowed. As it stands now a bounty of $5.00 is paid on the animals. Despite these retarding factors, however, I understand that last season the hunters reported more bears than for quite a long time. The chief point of increase is apparently in the National Forest.

Although North Carolina reports only a light kill during the past several years, officials claim bears are increasing rapidly, especially in the State and National Parks where they have good protection.

In Utah the picture changes and we learn that protection was removed from bears in 1929. The livestock interests at that time were controlling the Legislature and apparently have since, as conservation authorities have not yet been able to reinstate the bear as a game animal. He has shown a slight increase in the National Forests in spite of a year-round open season, however.

Wyoming apparently is not worried much over her bear population. Officials indicate they are on the increase and that it has not been necessary to give them any protection on account of their scarcity.

The black bear in Georgia would probably show a marked increase in a few years were it not for such a large number of virtually uncontrollable violations. As an example of what happens in this state, 150 black bears were killed in the last six months of 1933 on the borders of the Okefinokee Swamp, because some of the natives of that section were missing some of their swine. Officials cannot prove that the bears were not responsible, and for that reason cannot prosecute. It is their plan to trap off these bears in that section and place them in the various preserves in the northern third of the state, where they will be under full protection at all times.

By Act of Legislature during April, 1933, Colorado declared the black bear a game animal and fixed the first open season to begin in October, 1935. It also protected the cubs, and made a provision for taking, at any time, bears caught in the act of killing livestock.

In Idaho we again hear of depredations on sheep and cattle. Officials there claim that a great many bears have been killed as a protection to such livestock. They have only a three-month closed season in four northern counties at the present time, but contemplate making a recommendation to the 1935 Legislature for more complete protection for these fast disappearing animals.

Virginia believes bears are increasing slightly and reports approximately 100 killed during 1933.

Vermont reports bears on the increase despite the fact that there is no protection on them. It maintains no record of the bag each year but claims that numbers are killed and many of the cubs are taken each spring in captivity.

Wisconsin has had no open season for a good many years. Consequently bears have rapidly increased in numbers. I understand an open season is contemplated within the next year or so.

Arkansas had a closed season for the past six or eight years but lack of interest on the part of the hunters caused a less encouraging increase than they hoped for. They report about four killed during 1933 although they do not have accurate figures as their law does not require a report of the game killed.

During its last Legislature, Maine suspended for two years a bounty on bears which had been in effect in certain local areas for some time. During the period this bounty existed the bears killed annually numbered between 600 and 700. Maine officials claim they are holding their own and even increasing in closed areas where there is no bounty.

Although offering no protection to bears, South Carolina claims they are holding their own.

The bear is protected in Washington although no record of the kill is kept. Officials believe they are holding their own, claiming they are not particularly popular as game animals.

Bears are classed as game in Montana and a big game license is necessary to hunt them. Officials say they are on the increase.

Mississippi says there are probably not more than 75 or 100 bears in the State at the present time. She is doing everything to protect them, however, and on June 1, 1932, the Legislature declared a three-year closed season in all parts of the State. In all probability this season will be lengthened at the next Legislative Session.

In eastern Tennessee bears have been increasing rapidly. The cutting of timber on the North Carolina side drove them over on the Tennessee side. They were so common the people had to take their cattle out of the mountains the last two years because of the protection that the Government is giving them in the National Park. There is a small tract of land in the Smoky Mountain Park which is owned by the Little River Lumber Company where they allow hunting. During 1933 there were about 15 legal and 10 illegal bears killed on this tract. Officials believe the Government will buy the rest of the land in the next year at which time there will be a closed season.

Alabama reports an increase, especially in those sections in which game preserves are located.

New York reports a decrease and gives as a reason the fact that bears have had no protection for many years in certain counties. During the last session of Legislature, however, it was successful in providing a closed season throughout the entire State. New York keeps a record, and during 1927 hunters killed 122; 1928, 98; 1929, 177; 1930, 91; 1931, 51; and 1932, 102.

California gives very little protection to bears yet it is said there is no reason to believe that the animals are decreasing in that State. Practically the only protection is through a trapping license act. They can be killed at any time of the year when doing damage, and apparently sheep raisers think they are always doing damage. The State keeps no record of the number killed each year.

New Mexico placed black bears on the game list in 1925 and since then they have shown a remarkable increase. They may be taken only during the regular open season with or without dogs, except that dogs may not be used during the deer season. Traps of all kinds are prohibited. Officials claim the animals had reached a very low ebb until placed on the protected list. In 1933 100 were killed, a goodly number under the circumstances.

In Oregon bears are legal prey the year round except in certain counties where they can be hunted only during the month of November. No bag limit is specified by the law.

That the bear is in need of protection in Oregon is apparent. A questionnaire sent out by that State recently indicated that the greater portion of sportsmen's organizations were highly in favor of some adequate form of protection, conceding however that it should be treated as a predator and stock killer only in specific instances and not generally throughout the State. Whether or not sentiment will result in its classification as a game animal and admit them to protection remains to be seen.

Michigan reports a slight increase, although census taking in that State is a rather difficult task since they have to check both on their lower and upper peninsulas. The statistics are gleaned from reports of local fur dealers and from the number brought across the Straits of Mackinaw each season, however. During the past three or four years Michigan has been averaging around 300 bears annually.

Alaska submits an interesting report on her bear kill for the past ten years: 1923, 612; 1924, 453; 1925, 930; 1926, 486; 1927, 423; 1928, 709; 1929, 491; 1930, 1,125; 1931, 332; 1932, 251; 1933, 182. There must have been considerable thinning out in 1930 judging by the reports for the three years following.

Not only some of our own states but Canadian provinces are seeking to protect the bear. The writer just a short time ago received a letter from Manly Miner, son of Jack Miner, the originator of the famous Miner Bird Sanctuary at Kingsville, Ontario. He says: "Here in Ontario father and I are putting up a fight to try and make the Provincial Government realize the value of the bear as a tourist's attraction in the summer and a hunter's attraction in the winter and fall months. We would like to see a closed season only in the fall of the year when deer or moose season is on to let a hunter shoot a bear. We often point with pride to Pennsylvania."

The bear deserves all the protection he can get, in the east, west, north and south, and the writer sincerely hopes that those who have the interests of these splendid animals at heart—and there are many—will continue their efforts to protect and increase it.

There is no excuse, as I see the picture, for failing to do so. Proper means can be instituted to take care of all conditions and any excuses, to me at least, exist solely because of selfishness of certain interests. But it is believed that those who have the real interest of both the bears and the public at heart will work until they win.

Duck "Abundance"

The usual tale of many ducks comes from Maryland officials

A PAIR OF PINTAIL DUCKS

FROM Maryland, prize stand-patter for the continued killing of waterfowl as long as there are any, comes a characteristically optimistic article published in the *Maryland Conservationist,* winter issue, from the pen of its state game warden. It bears the title: "Who said there were no ducks?" It consists mainly of a series of statements of estimated numbers of canvasbacks, scaups and redheads observed on Maryland waters, and concludes that there was no scarcity of wild waterfowl in Maryland last season. The author feels sure that, because shooting was not so good as usual, there were various reasons:

"Without a question of a doubt, there will be hundreds of thousands of birds saved from the gun this season and the kill of wild waterfowl in Maryland naturally will be much less than it has been in seasons heretofore. Weather conditions have been unusually poor for shooting on the open days. It seems that what suitable weather we have had for the hunting of wild waterfowl has occurred on Monday, Tuesday and Wednesday, which, under Federal regulations, were closed days, and bluebird weather has prevailed on Thursday, Friday and Saturday, the open days.

"We feel sure there will be as many, if not more, birds leaving Maryland's watered areas for the nesting grounds in the spring of 1935, than there has been for a number of years past. We sincerely hope that these birds will find favorable conditions in their nesting grounds and will return to us in the fall of 1935."

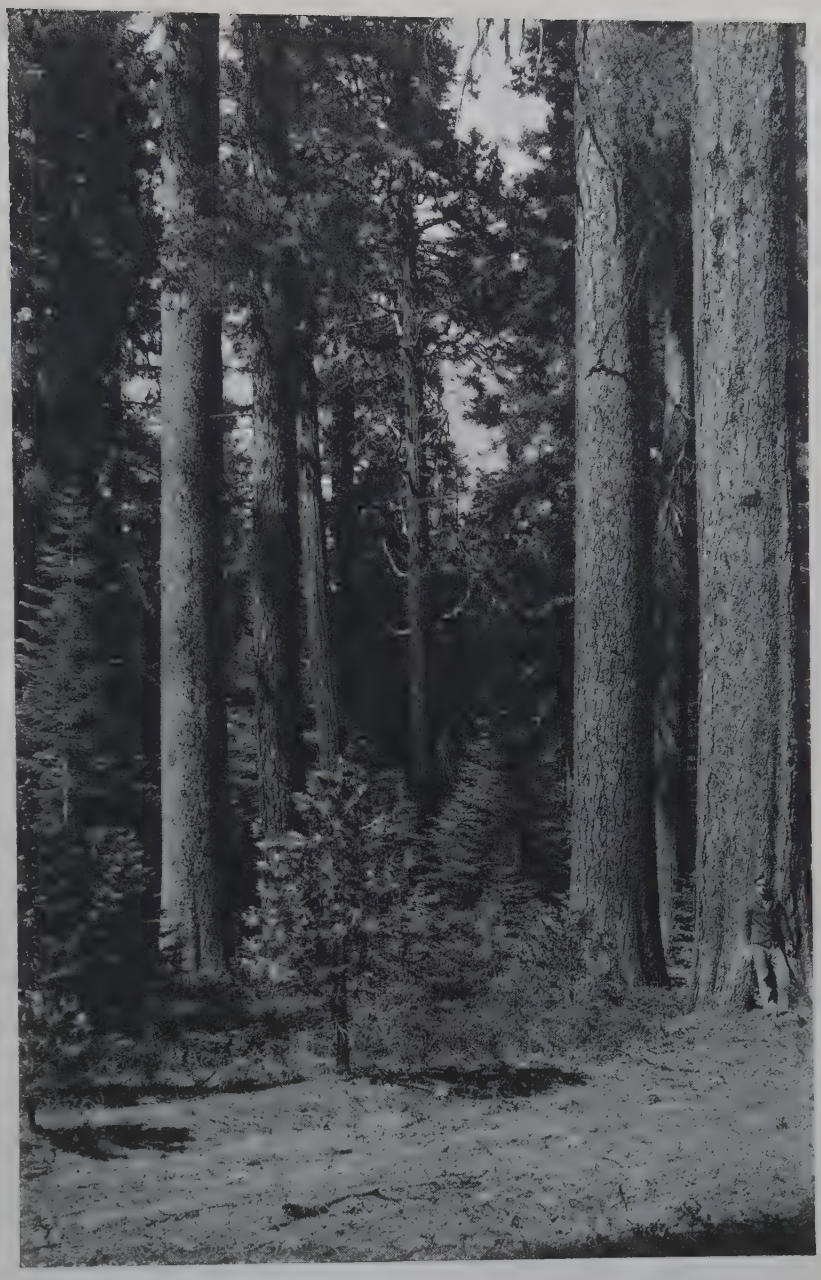
The article is illustrated by a photograph of a number of eminent citizens with a moderate bag of ducks and geese, with a legend that advertises the excellent products they manufacture.

In her eagerness to harvest as many as possible of the wild waterfowl that are raised mainly in Canada and Alaska, Maryland differs from the majority of the other 47 states only in degree. It so happens that she has in her territory a larger share of congenial wintering ground for waterfowl than most states. In fact, so alluring are Maryland's waters, both from their extent, and the richness of the supply of food for ducks and geese, that there has been built up what its defenders are pleased to call a "waterfowl industry." We do not know the value of the investment in this industry, or the value of the dividends it pays, but we do know that its members and beneficiaries have no title whatever to the resource in which they have invested. Of about 20 species of ducks and geese that winter more or less regularly in Maryland, only three breed within the state, and these in such small numbers that their increase would not form one day's bag limit for one per cent of Maryland's 6000 waterfowl hunters. Thus most of the black ducks, mallards and blue-winged teal, and all of the 17 other species that are killed there, come from Canada and Alaska. The hope expressed in the report cited, that the birds that leave for the nesting grounds this spring will find conditions favorable and return, is one of the rare instances where Maryland has made any reference to its indebtedness to other sections. Usually this fact is ignored in all claims for greater killing privileges for Maryland gunners, and all boastful statements of the numbers of waterfowl that winter in the state. One can read page after page of testimony and propaganda put forth by the defenders of Maryland's right to harvest waterfowl, by all the methods known to man to outwit helpless birds, without finding any reference to the source from which come these birds. Rarely, indeed, will one find any reference to Maryland's birds ever occurring elsewhere, unless it is desired to show how many waterfowl are fed there, and allowed to pass on.

We have often referred to this tendency, but the importance of the matter is so great that it cannot be ever over-emphasized. The fact that game birds from the North were exposed to gunfire from many different communities in the flight through our states is the primary reason that it was considered necessary to have a treaty with Canada for their protection, and to make this protection a matter of national concern, in place of leaving it to the hopeless chance of state forbearance. But the states, like individuals, are selfish. We, therefore, find the fight for continued killing a sort of free-for-all, with the participants blinded to everything but their own immediate interests, jealous of the neighbors, regardless of the future, and indifferent to any interest in the birds by any class of citizens other than the hunters. We thus find Congressional hearings for conservation of wild life packed with the representatives of hunters, resort owners, manufacturers and dealers of sporting arms and ammunition and other representatives of commercialized destruction, a phalanx against which the defenders of wildlife are but a pitiful minority.

Now, when we find our supply of waterfowl down to the dregs, it is time for their real friends to give them respite from the gun.

Save Yosemite Sugar Pines



THESE TREES ARE WORTH SAVING
Sugar pine forest near Carl Inn in the region formerly in Yosemite National Park. It should be saved and restored to the Park

All who have entered or left Yosemite National Park by way of Stockton or Tioga Pass over the Big Oak Flat Highway will remember the trip for one reason—the magnificent forest of immense sugar and yellow pines that line the road from Tuolumne Sequoia Grove to Carl Inn. Soon that trip may be made through the desolation that follows upon a logging operation, for these pines are not, as many undoubtedly think, the property of the people, administered either by the Park Service or the Forest Service.

When Yosemite Park was set aside this forest was within its boundaries. In the raids upon the park in 1905 and 1906, however, 387 square miles were taken away. This was, of course, at a time when infinitely fewer Americans had visited their National Parks and come to know and value them. As a result they could then be more easily robbed of their possessions by private interests than would, we believe, be possible today.

Much of the area cut out of the Park has been since logged off. In 1929, when lumbering operations on private holdings within the Park threatened Tuolumne Grove, public sentiment demanded action. Congress appropriated $1,600,000 to acquire these holdings, and this was matched, as required in the act, by a similar amount given by John D. Rockefeller, Jr. Thus a fatal devastation was averted, but the splendid sugar pines along the Big Oak Flat Highway were not included in this purchase.

Second only to the sequoias, the sugar pine is one of the largest, most impressive and remarkable trees of our western forests. It is, also, of high commercial value, and commerce is usually little concerned with beauty or posterity. So the axe will ring against the trunks of these two-hundred-foot forest giants in due course. That is, it will unless action is taken to restore to the American people that which never should have been taken away from them.

The solution is embodied in Senate Bill No. 615, introduced by Senator Nye and now pending in Congress. Under the terms of this bill the Secretaries of Interior and Agriculture are authorized to appraise the fair market value of the timber located in the specific area affected and to exchange therefor timber of equal value situated within any National Forest in California. The area thus acquired would then become a part of Yosemite National Park.

We believe that this measure should be enacted into law. We believe that the desirability of saving these trees far outweighs objections that the mechanics of trading the timbered area are difficult. We believe that they can be made simple. The people own the National Forests and the National Parks. The Forest Service and the Park Service are merely entrusted with the administration of these properties in the best interests of the public. We believe that this action in behalf of the Yosemite sugar pines is in that best interest.

For a Closed Season

IN *Bird-Lore,* March-April 1935, the National Association of Audubon Societies has an illuminating article on its campaign to close the season on waterfowl. With the necessity for this move, the Nature Association and several other national organizations are in hearty agreement. We are glad, therefore, to be able to quote such parts of its announcement as our limitation of space allows.

"At the American Game Conference meeting in January, the Audubon Association sponsored the following resolution:

" '*Resolved,* that the American Game Conference, recognizing the necessity of further limitation on the kill of migratory waterfowl in order that an adequate breeding stock of these birds may be restored, endorses a closed season for one year beginning September 1, 1935, together with provision of assignment of adequate Federal enforcement personnel to make such closed season effective.'

"The latter part of this resolution was altered and passed in a form which called upon Congress to appropriate sufficient funds, to be made available to the Biological Survey, to enable it to enforce the migratory waterfowl hunting regulations. Every effort should be made to convince Congressmen of the importance and immediate need of such appropriation.

"The Resolutions Committee was unwilling to take a stand as to the first portion of the resolution, preferring to 'pass the buck' to the Chief of the Biological Survey. It brought to the floor a resolution which passed:

" '*Resolved,* that the American Game Conference hereby records its unqualified approval of the efforts of the present Chief of the United States Biological Survey and pledges its utmost confidence and support of such regulations as may be recommended by him for the shooting of wild waterfowl during the 1935 season.'

"The Audubon Association, desiring a test vote of those present at the Conference, brought the first half of its resolution to the floor as a minority report. This procedure was opposed on parliamentary grounds, but a vote was taken and the Association's resolution was rejected, 38 to 22. That more than one-third of those voting at this particular Conference supported the Association's stand is, in our opinion, indicative of wide public approval."

Following the Game Conference in late January, the Audubon Association sought to obtain, from game protective organizations and a number of the more prominent sportsmen, expressions of opinion. In support of a closed season there were received from state organizations such expressions as the following. We hope there were others.

"I believe there should be a closed season on migratory waterfowl for one year, as I am convinced beyond a question of doubt that ducks and all migratory birds are decreasing rapidly. I believe we should begin protecting our birds before the last one is gone and it is too late to do anything for them. (John H. Finley, Commissioner, Department of Fisheries and Game, New Hampshire.)"

As coming from a prominent sportsman who is also a naturalist, we are glad to quote in full the following clear expression of the general situation.

"But we must reduce the killing of ducks to the point where the natural increase is sufficient to replace all losses, and how can this be done without reducing the guns? It is understood that the migratory birds belong to the nation, that is, to each and every person. Therefore, no one person has any right to take more than he can guarantee to replace either directly or indirectly; actually or in kind. The days of God-given rights in free shooting are over. Duck-shooting is nowhere a necessity in the United States and is rapidly approaching the status of golf or tennis. Some scheme for a pay-as-you-go policy must be worked out in the future. It is a question of this, or no shooting at all. The duck shooter has got to make his choice, and the sooner he learns about the ultimatum which stares him in the face, the better it will be for us all, but especially for the ducks. Until a new deal for ducks is worked out, all killing should cease. At the least, we should have a closed season for 1935. We owe this to Canada. She produces the ducks; we kill them. Therefore, in order to show that we have taken the terms of the 1918 Treaty seriously, we should call a halt and take

Pierre Samuel Du Pont de Nemours was an eminent French statesman, educator and writer, the father of two sons who founded the powder and ammunition company in Delaware. In 1782, at the time when he was engaged in drafting the treaty recognizing the independence of the United States, M. Du Pont wrote a letter containing a paragraph well worthy of quotation. He wrote:

"A nest is a little home which is used by a father and mother for the care of their children. The eggs are children in swaddling clothes and are so dear to their parents that they will go without food or water and even risk their lives rather than cease to care for them and keep them warm. They are, therefore, capable of much tenderness and love. They are made differently from us but have the same affections as we do. I know very well that if a great animal, as much stronger than I am as you are stronger than a little bird, came to steal Victor and Irénée, or only one of them, your mother and I would be in agony, and if I could not kill him to defend you I think I should die of grief. That thought makes me very unwilling to cause a sorrow that would be so great to me, to any of these little animals with which we are not at war. Think it over!"

account of the stock. The only way we can make an adequate diplomatic gesture is by having a closed season for 1935. Whether Canada follows suit is none of our business, as we have taken our share many times over in the millions of Canadian-bred waterfowl which we have killed every year. Canada, with her lesser population, may be able to continue a system of free, or very nearly free, shooting for some years to come, but we have come to the end of pioneer privileges and must regulate all of our wildlife killing on a numerical basis, as they do in most civilized countries of Europe." (John C. Phillips of Massachusetts.)

Many other expressions eloquent of the need to close the season for at least one year were received by the Audubon Association from prominent sportsmen in Maryland, Massachusetts, New York, North Carolina, Wisconsin, North Dakota, and California.

As an expression of a point of view differing from the above, *Bird-Lore* quotes as follows from an address delivered on February 26 by Max D. Hart, Executive Secretary of the Game and Inland Fisheries of Virginia:

"I submit we hunters do not propose to supinely permit any set of people to do this regulating job for us, but will do it ourselves in our own way, as in our opinion we may deem best. I feel that through our efforts the U. S. Migratory Bird Law was enacted and the Bureau of Biological Survey charged with its enforcement. I feel we are the masters and not the servants of the Bureau of Biological Survey and that when matters affecting what our hunters deem inimical to their interests arise, this Bureau would be ungrateful indeed to ignore the wishes of the men who endowed it with whatever power it may have in the premises."

This point of view, which, to say the least, is interesting, is one that seems to be gaining ground as the years go on, and as the game birds decrease. We propose to discuss it rather fully in the near future.

Jack Miner, native Buckeye, but Canadian by adoption, rightly claims to be 100 percent American. In a recent declaration widely circulated, he proposes some reforms that he claims will bring back migratory game. He delicately alludes to the fact that Canada now has the small end of the horn, in that its people have only about three weeks of shooting at the ducks they raise. He proposes a $5 license fee for four weeks' shooting and a seasonal limit of six ducks and two geese. (This is probably more than the gunners now get, on the average.) He thinks that by such a plan breeding grounds and other refuges could be built up. But—he says that live decoys, baited fields, rented blinds, and all other such unfair practices and commercialized methods must be abolished. Aye, there's the rub!

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We hope Jack Miner lives until the game-hogs of America agree to his plan, and that they don't exterminate the game first.

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It is with pleasure that the officers of the American Nature Association and the editors of Nature Magazine announce that William L. Finley, nationally-known naturalist, conservationist and Nature photographer, has been added to the staff of this Conservation Department of Nature Magazine. Mr. Finley will concentrate on field work, studying important conservation problems and current methods being employed in their solution and providing authentic and up-to-date information for this department.

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Unless the National Bird of the United States is accorded protection under House Bill No. HR 5271, now pending in Congress, or some similar broad-gauge measure, it is doomed to join the list of extinct birds. It is difficult to believe that Americans will permit such a travesty and allow such a fate to befall our National Emblem. Recognized as such by the Continental Congress in 1782, the eagle has become the victim of civilization, of unprovable assertions that it is harmful, and of man's desire to kill. It must be protected. The list of national and local organizations behind the pending legislation is long. The Emergency Conservation Committee, the National Association of Audubon Societies and many other national groups are actively supporting it, as is, of course, the American Nature Association. Let your Congressman know that you expect the passage of this measure at this session of Congress.

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Designed to illustrate the need for active conservation measures to protect the wildlife of America, the Field Museum of Natural History in Chicago has opened a special exhibition of extinct birds. In announcing the exhibit, Rudyerd Boulton, assistant curator of birds, pointed out that "man's dominance of the earth has greatly, and unnecessarily, speeded up the rate of extinction." Eight species of North American birds have become extinct in the past thirty-five years, twelve in the past century. And man is doing his best to add several species of migratory waterfowl to the extinct list.

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The Multilateral Convention for the Regulation of Whaling agreed to by the economic committee of the Council of the League of Nations on September 24, 1931, yet awaits the signature of the United Kingdom of Great Britain and Northern Ireland to make the convention effective. The convention has been ratified by the following nations: United States, July 7, 1932; Norway, July 18, 1932; Union of South Africa, January 11, 1933; Switzerland, February 16, 1933; and Mexico, March 13, 1933. In addition to these ratifications, the following have signified adherence to the convention: Sudan, April 13, 1932; Nicaragua on April 30, 1932; Monaco, June 17, 1932; Brazil, November 21, 1932; and Egypt, January 25, 1933.

Vermin Hunts

INSPIRED by the manufacturers of arms and ammunition as a means to finding increased outlet for their products, there is a dangerous increase in organized but unofficial drives against so-called predators. Variously called "vermin hunts", "varmint hunts", "crow shoots", or some other festive name, gun clubs, faced with fewer things to shoot and less time to shoot them in, are gaily joining in such affairs.

Michigan "sportsmen" recently staged one of these hunting parties and used up so many shells that the Milwaukee Gun Club became jealous and decided to go them one better. They announced a "varmint" hunt to kill off all crows, grackles, hawks, starlings, kingfishers, owls, snapping turtles, weasels, striped gophers and snakes in southeastern Wisconsin. The self-appointed exterminators will be broken up into teams with points for what they shoot—20 for a large owl; 10 for each small owl, hawk, crow, grackle, snapper and weasel; five for other alleged predators. Species shot "by mistake" will, of course, not be counted.

The announcement of the hunt brought vehement and proper protest from the directors of the Wisconsin division of the Izaak Walton League, the conservation chairman of the Wisconsin Federation of Women's Clubs and true conservationists generally. A. J. Baum, secretary of the gun club, countered by announcing blandly that "owls and hawks and crows and snappers are going to be killed whether the old grandfathers of the Izaak Walton League like it or not. The hunters know what destruction they do and will shoot them every chance they get, *protection or no protection.*"

We have expressed our opinion of these hunts many times. On this occasion we will let the excellent editorial in the *Milwaukee Journal* voice our view. Under the title "Gun-Toting Saviors", the newspaper says:

"The Milwaukee Gun Club is inviting its members to join in a big 'crow shoot,' in May.

"Since the members may not get within gunshot of enough crows, the club suggests that they also shoot hawks, owls, kingfishers, gophers, snapping turtles and snakes.

"So we're to have another horde of wilderness saviors going about 'correcting' conditions that they don't understand.

"For, of course, the excuse for this crow-hawk-owl shooting expedition is 'conservation.'

" 'The way to preserve game is to destroy the wild, worthless birds, animals and reptiles that kill,' says the club's circular.

"Well, for years the informed scientists of the Milwaukee public museum have been patiently telling us how important, necessary and beneficial some of these 'killers' really are.

"They do more to control rodent life than any other force we have. They thereby protect what would be the victims of rodents, including many of the most desirable birds. They are the 'balance' in nature, the policemen of the woodlands and fields.

THE BARN OWL—A VALUABLE BIRD
It is a great aid in checking rodents, yet, in vermin hunts, is often killed merely because it is an owl

"Some may need 'control' by men. It is needless to come to the defense of crows, for instance. But probably not half a dozen members of any gun club know the difference between a Cooper's hawk and the rest of the clan; between the great horned owl and the beneficial barn owl.

"When control of any species is needed experts should do the controlling—and they should be really informed and thoughtful experts.

"Everywhere we have evidence of miscontrol and its effects. Wolves and coyotes have been desperately hunted in the north and now rabbits are overrunning the land.

"Wildcats have been relentlessly shot and today whole plantations of young evergreens are stunted and dwarfed by red squirrels.

"The small, harmless and beneficial snakes have been destroyed, along with the larger kinds, until the woods and fields swarm with insects that are annoying and damaging to men, birds and animals alike.

"So it goes, all down the line. When self-appointed saviors of the wilderness set out to shoot some sense into nature they inevitably do more harm than good.

"The more thoughtful members of the Milwaukee Gun Club ought to stop this proposed 'crow shoot.' "

Leopold on Waterfowl

FROM the March 8 issue of the *Taxpayer's Review* of Denver, Colorado, we are glad to quote in part from a report on the national game situation by Professor Aldo Leopold, of the University of Wisconsin. This article, written by a member of the President's Committee on Wild Life Restoration (See *Nature Magazine,* April 1934, p. 157) constitutes a powerful appeal to stop shooting our disappearing waterfowl, and rebukes a system of so-called conservation that allows the advocates of continued killing to dictate policies that are destroying forever a beautiful and useful resource. We quote:

"The ducks need two things: More marsh and less killing. They need not the one or the other, but both, and right away. . . . Doubtless we should have had a continental closed season in 1934. It is clear, though, that many states and clubs were not ready to support and enforce any such move, partly because of disruption of state fiscal structures. Expressed in terms of game policy, 1934 taught us that our administrative engine, being dependent upon shooting revenues, stalls when the mixture gets too thin. This, of course, is when we need it most.

"To risk the further decimation of the waterfowl resources because we lack a few dollars for enforcement is unthinkable as a national policy, especially at a time when millions are freely spent on each of a dozen other emergencies arising from misuse of land. I see no recourse but to close, and to pay the cost out of the federal treasury.

"If total closure is not acceptable as a way to curtail the bag, what is? The duck hunter's favorite answer is to blame the over-killing on some other state. I know marshes in Wisconsin where hardly a live duck has wet a leg during legal daylight for the last decade, but where the hunters, nevertheless, plead with almost tearful intensity that their duck troubles all arise from the slaughter pens of Illinois and Arkansas. This little comedy has been repeated annually for two generations. It delayed the passage of the Migratory Bird Law ten years. It is no answer to the present emergency.

"If we don't close, how else will we cut the kill in 1935? We can, to be sure, further trim the season, or the bag, or the armaments, or all three, but this is trimming and not cutting. Trimming will be in order when it is time to reopen. . . . The state which merely scrambles for more than its share of the annual crop should be given some incentive for internal reform. The criteria of state cooperation should include not only state participation in marsh building, refuges, law enforcement, and research, but an actual showing by each state in reducing the annual kill. This implies an annual federal computation of the kill by states, which in turn implies the licensing and regulation of clubs, and a compulsory kill report from each club and each hunting license. The present 'baiting permits' should perhaps be regarded not as an official recognition of iniquity, but rather as an opening wedge toward this distant but important goal. States are already required to qualify for federal dollars, why not for federal ducks? . . .

"The idea of rewarding the farmer for game cropping has made some headway. I am not convinced, however, that shooting revenues alone are a sufficiently powerful incentive to bring thousands of farms under management. I now am inclined to believe that the full development of game cropping on farms, as well as most other kinds of conservation, must await some rather fundamental changes in rural culture and in land economics. . . . Conservation, in short, is at direct variance with the moral and esthetic standards of our generation, and until these standards change, we can have only such fragments as happen to come easy."

By Way of Comment

It is only natural that we should be pleased by the favorable response that has come from the inauguration of this conservation section of NATURE MAGAZINE. Some of the letters commenting on the department contain thoughts and information worth passing on to others. For example, there comes from E. M. Dahlberg, for five years a member of the Wisconsin Conservation Commission, the following:

"The trouble with most so-called conservationists is that the majority of them are just killers of one kind or another. In general this is true of the whole tribe of hunters. The conservation creed of the average rod and gun club is just the extermination of something. Fishermen in Wisconsin want the herons killed because they eat a few small fish. They also want the beaver destroyed because they dam the trout streams and make the water too deep for wading. Hunters of game birds promote the wholesale slaughter of all kinds of birds of prey, although the average hunter can't tell a sparrow hawk from a horned owl. The much-persecuted predatory animals have been practically bountied out of existence. The wolf, wild cat, fox and coyote are reduced to such an extent in Wisconsin that hundreds of CCC boys have been engaged in killing snow-shoe hares with clubs. (This was either to save the young trees or to give the boys exercise, I don't know which.) The United States Forest Service, with the aid of the Biological Survey, will probably wipe out the porcupine and the snow-shoe hare. In spite of protest, a poison-spreading program went on a year ago.

"Even the Conservation Commission is guilty of an unspeakable form of exploitation of the wildlife. I refer to the license system which is the chief source of departmental revenue, and, therefore, worked to the limit on many species that are already shot out beyond any hope of preservation. The building of hundreds of miles of fire lanes into wilderness during the last two years was followed by an open season on bear and deer last fall. Thousands of hunters found access to areas where only a few hardy woodsmen had ever been before. The toll was tragic, to say the least, and probably will, in the end, prove fatal to these two species of Wisconsin mammals. In the Wisconsin game laws we now have just two animals that have the full year round protection of the State. They are the moose and the elk which have not been seen here for a quarter of a century. All an animal has to do to earn its protection in these sporting states is to become extinct.

"Let me congratulate you for the fine militant stand you are taking. I wish you great success, and I know that there is no organization that is better able to carry on in this cause, and no magazine better suited to be its spokesman."

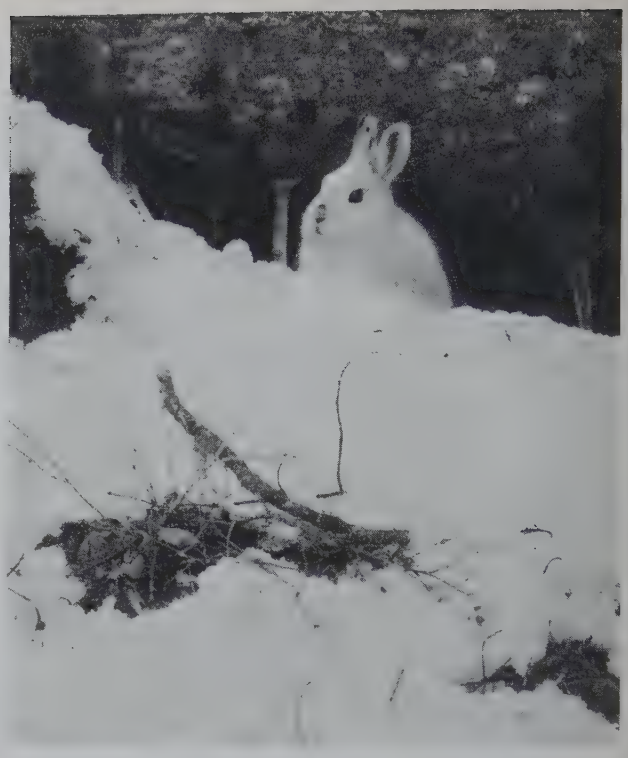
From Dr. William T. Hornaday come words we quote with, we trust, pardonable pride:

"From its first inception, Nature Magazine has been a shining example of American magazine making at its best, and constantly maintaining the highest level in magazine literature, art, and sound doctrine.

"Out of the welter and ruck of bally-hoo magazine literature that now is sweeping over this country like a pestilence, and leaving a great wreckage behind it, Nature Magazine looms up as the pyramid of Cheops rises far above the Lybian Desert. The true beauty and wholesomeness of Nature Magazine is a tribute to the good taste of a section of the American people, and a monument to its makers.

"Your continuous stand for the sane and forceful defense of wild life, and your fight against the extermination of species, is fitly crowned by the important step that you have taken in the creation of your new Conservation Department."

Mrs. Delbert Swartz, editor of *Wild Flower,* of the Wild Flower Preservation Society, writes hopefully thus:



SNOW-SHOE HARE

"More power to Nature Magazine and its splendid new department—Conservation. It is a very timely addition. I hope it will awaken many readers to the need of protection of many phases of our native beauty and wildlife."

"An enthusiastic hunter" all his life, Wright M. Pierce of Claremont, California, calls the new section "an admirable addition to an already excellent publication." He writes:

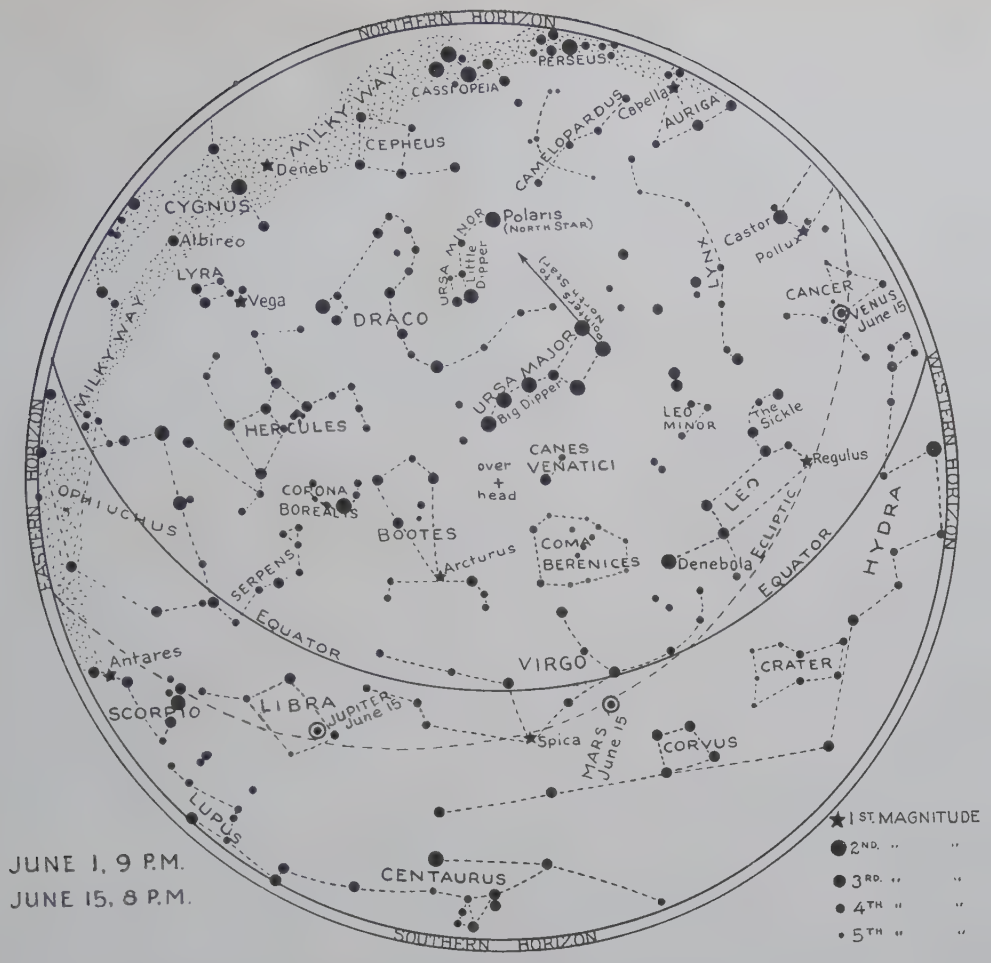
"I especially agree with you on your waterfowl conservation statements. I have been an enthusiastic hunter all my life but, realizing the plight of our ducks, did not even go out once last season. I did not have the heart to kill even one of the pitifully few that were left. . . . Everyone must become educated to the fact that the ducks and geese do not belong to the hunter alone—they belong to all of us."

From Mrs. C. N. Edge, chairman of the Emergency Conservation Committee, come the following encouraging words:

"The Conservation Department of Nature Magazine, so ably edited, is a contribution to the cause of conservation not likely to be surpassed in the year 1935. We congratulate you on this fine development of your magazine; we thank you for this wonderful effort toward the preservation of our wild creatures and the beauty of our country."

Word from Louisiana comes from Karl E. Pottharst of New Orleans, who enters a plea for a spread of the conservation message through his state, which, for example, permits robins to be slaughtered by myriads. He says that in his section "a most deplorable situation exists in which no one cares, no one knows and no one intends to find out. Killing has been elevated to a positive quantity and preserving to a negative one."

These are a few of the expressions of opinion and approval. We trust that we may be able so to conduct this new section that it may continue to merit these much appreciated words.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south

Hercules, the Giant Sky-Figure

By ISABEL M. LEWIS

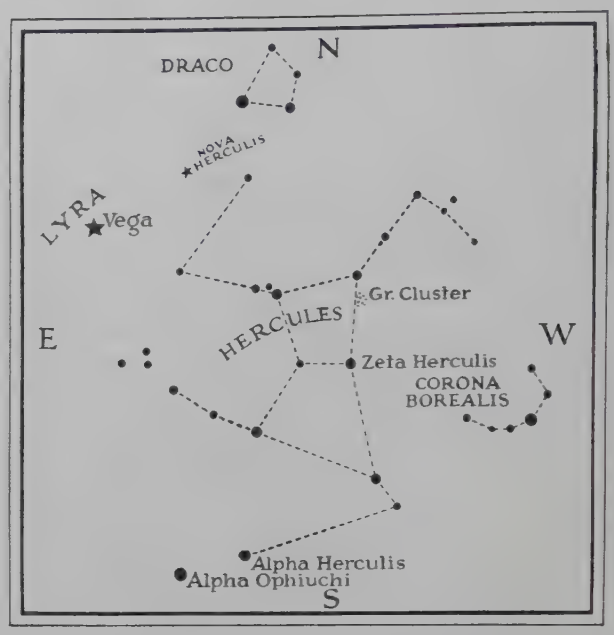
On any clear summer night one cannot fail to find the huge form of the giant Hercules, one of the oldest and best known of the northern constellations. It lies between two of the smallest and most beautiful of the summer groups, Lyra, with its brilliant diamond-like Vega, on the east, and that exquisite little celestial crown, known as Corona Borealis, on the west.

Hercules fills all of the space that lies between Draco, in the far north, and the enormous constellation of Ophiuchus, in the south. Thus it lies overhead in mid-latitudes of the northern hemisphere when crossing the meridian. As represented on the star atlases that show the mythological figures, Hercules rests on bended right knee with his left foot on the head of Draco. In his uplifted right hand is a club, and in his left he holds the triple-headed serpent-tailed dog Cerberus, custodian of the lower regions, and the apple branch bearing the golden fruit from the garden of the Hesperides, which was guarded by Draco. To gather this fruit, it may be recalled, was one of the Twelve Labors of this hero of classical mythology, whose form we are supposed to see depicted in this huge constellation.

The head of Hercules near the southern boundary of the constellation is marked by the irregularly variable, double star, Alpha Herculis, which lies only a short distance to the northwest of the second magnitude star, Alpha Ophiuchi, in the head of Ophiuchus, The Serpent-Bearer. Alpha Herculis is a super-giant star of the same type as Antares, in Scorpio, now visible in the southern sky. It varies in brightness from third to fourth magnitude. Light from this star takes more than four and a half centuries to travel to the earth. It is also one of the coolest stars, with a surface temperature of about 4700 degrees Fahrenheit.

In the constellation of Hercules there are no stars of the first or second magnitude but many of third and fourth magnitude. Its finest object, when viewed with the aid of a powerful telescope, is the Great Hercules Cluster.

It lies about five degrees to the north of Zeta Herculis, which is, by the way, a most interesting double star, and it can be seen even by the naked eye on a clear, moonless night as a faint patch of light. It also lies about mid-way on an imaginary line connecting Vega with Arcturus, though somewhat nearer to Vega. In the smallest telescopes it is disappointing because it cannot be resolved into its individual stars and is merely a knot of nebulosity, but in a powerful telescope it becomes a wonderful globular star cluster composed of between 2000 and 3000 tiny points of light. Each is a giant sun. At the enormous distance of this cluster from the earth, which is about 35,000 light years, a dwarf sun, such as our own, would scarcely be distinguishable, even in the greatest telescopes. All of these stars are crowded, apparently, into a space no greater in area than one-sixteenth of that occupied by the full moon. In reality the space between individual stars is undoubtedly to be measured in trillions of miles, or several light years, and the diameter of the cluster is estimated to be about 500 light years. The center of the cluster shines with a faint, nebulous light, due probably to the combined light of stars too faint to be seen individually. The most conspicuous stars in the cluster, though they are all extremely faint due to their great distance, are reddish stars and all are super-giants such as Antares or Alpha Herculis. The best photographs of the cluster show about 50,000 star images and there must be many more stars too faint to be seen.



There are about 100 such clusters called, because of their form, "globular star clusters". Even the nearest, known by the names of 47 Tucanae and Omega Centauri, and located in the southern hemisphere, are more than 20,000 light years away and the most distant is about 230,000 light years from the earth. These clusters, strange to say, are nearly all in one half of the heavens, and they are, without doubt, universes of stars, although astronomers are still questioning whether they are independent of our own galactic system or form with it a sort of super-galaxy. They are far exterior to our own Milky Way system, and, like the spiral nebulae, may be island universes, although they differ from the spirals greatly in many respects and also lie much nearer to our own galaxy. Were we on a planet circling around one of the stars in a globular cluster it is certain that our heavens would be a blaze of glory with many brilliant orbs surrounding us in all directions. The neighboring stars would be closer, and far brighter than our stellar neighbors in the Milky Way, although there would be ample room between stars, many trillions of miles, in fact. So there would be no fear of stellar collisions. Although outbursts of novas indicating celestial catastrophies appear to be not unusual in the spiral nebulas, they are not observed in globular star clusters, which appear to be remarkably orderly and well-organized systems.

Since the discovery by Prentice at Stowmarket, England, of the new or temporary star known as Nova Herculis, many eyes and many telescopes have been turned in the direction of the constellation Hercules. Many photographic plates have been exposed and many spectra have been obtained of this remarkable object. A wonderful opportunity has been presented to extend our knowledge of these unexpected stellar outbursts of which so little is still known. If it had followed the usual course of a nova this star would probably have sunk below the limit of visibility to the naked eye before this writing. What it will do in the next few weeks we will not venture to predict. A nova may go through many strange antics in a few weeks, and Nova Herculis now has the astronomers guessing because of its unusual behavior since its discovery on December 13, 1934. Instead of fading quite rapidly away within a few months or even weeks, as appears usual with novas, it has maintained for several months a fluctuating brightness. As the history of this nova is still in the making we will not try to record it this time but suggest that our readers keep an eye on the position of the nova given on the chart for unusual performances in which it may indulge during the summer months.

Among other astronomical events there will be a small partial solar eclipse, one of the seven of 1935, that will occur in north polar regions on June 30. It will occur in the British Isles and southern Norway and Sweden at sunset. The sun will also reach its greatest distance north of the equator and summer will begin on June 22 at 3:38 A.M. E.S.T.

Venus will attain its greatest elongation east of the sun on June 30 and will be a magnificent object in the western evening sky all the month, passing from Gemini through Cancer to Leo. Mars may be seen in Virgo close to Spica in the northwest, and is always distinguished by its ruddy color. Although rapidly decreasing in brightness it is still a match for Vega in splendor at the end of the month. Jupiter is now in Libra and may be seen in the southeast in the early evening. Saturn is in quadrature with the sun on June 1, rising about midnight. Mercury will not be favorably placed for observation except during the first few days of the month.

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Trailside Treasures

A Tiny Friend

By JANE ADAMS PARKER

Illustrations by Jex

"I THINK this is just the nicest way to go treasure hunting," said Rosy, "to stay all day long in the woods."

"And how good our breakfast and lunch tasted cooked on the outdoor stove," said Jo.

"We're getting a lot of treasures for our Trailside Treasure House, too," said Jerry. "There're all those taddy toads and taddy frogs and taddy salamanders that hatched out of the eggs I saw floating on the water."

"And we learned a lot about them," said Jo. "I'll always remember that the real black tadpoles turn into toads, and that toads lay their eggs in long jelly ribbons, usually stuck to some weed-stem."

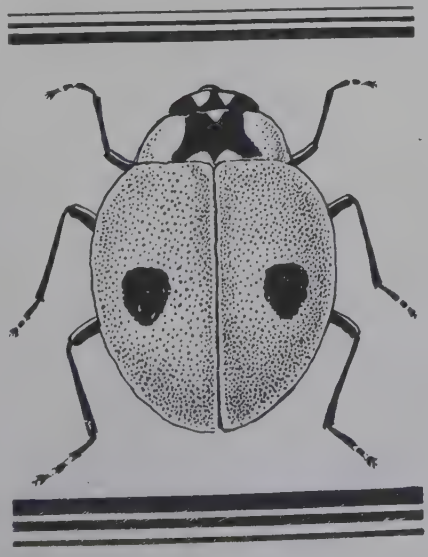
"And frogs and salamanders lay their eggs in masses," Jerry reminded her. "And toad tadpoles change into toads much quicker than frog tadpoles turn into frogs, and hop off."

"That's because toads live in the water only when they are tadpoles," Aunt Dot explained. "Both salamanders and toads spend most of their lives on the land, just coming to the water to lay their eggs. That is, this kind of salamander."

"Let's sit on the ground," said Rosy, sliding off to plump herself down by Aunt Dot, "and maybe we'll get a story."

"I think I'll stretch out on this soft moss," said Grandpa Arnold, "and have a little snooze."

"I'm going down the trail," said Jerry. "It takes me to find the live treasures."



"Now," said Jo, sitting down on the other side of her aunt, "what are you going to tell us about, this time?"

Aunt Dot smiled and pointed to Rosy's arm resting on the ground. "I think," she said, "it'll be about our tiny friend running up Rosy's arm."

"Why, it's little Mrs. Lady Bug," said Rosy. "Isn't she tiny!"

"Let's look at her under the magnifying glasses," Aunt Dot said, "and see how tiny she is then."

"Ooooo, she looks like a great big beetle now, with a red-brown shell," said Rosy, "with black spots all over it."

"She is a beetle," said Aunt Dot. "That means, for one thing, she chews her food. The ants milk the aphid cows, but Mrs. Lady Beetle eats them for her dinner, the way you eat beefsteak. Then when the eggs she has laid on the underside of the leaves, or in the cracks of the rough bark, hatch out, these larval babies eat the aphids, too. They are often quite handsome, marked with black, blue or orange, and, my, such hungry little fellows! Let's turn her on her back. Now you can see her shell is a half sphere, with the flat side down."

"Her feelers have little clubs on the ends," said Jo, looking closely. "I guess nothing can hurt her in that hard shell."

"Well, she does have one fierce enemy," said Aunt Dot, "the assassin bug. He knows there's a tiny soft space between her head and body, where he can

thrust in his sharp beak and suck her blood. When he gets through with his meal, only her shell is left."

As she spoke, Aunt Dot put Mrs. Lady Beetle back on her feet again.

"Lady Bug, Lady Bug, fly away home," Jo began. And just as if she knew what Jo was saying, Mrs. Lady Beetle opened her wing cases with a click. Out came a pair of dainty wings, and off she flew.

"There's another story about that old rhyme of Mother Goose's," said Aunt Dot. "In England, where they say the dear old lady lived, they used to burn the hopvines after harvest. Usually they were full of aphids, so, of course, they were full of lady beetle larvae, as well. Out West, where the lady birds hide away in great masses under the leaves in the mountain forests, to hibernate, the fruit growers gather them by the load, and keep them in a cold place, until they want to use them to help get rid of the aphids. Really, there is so much to tell about our good little friend, that I can't begin to tell half."

As she paused, the clear, shrill call of Jerry's whistle sounded from somewhere down the trail. That meant, "Help."

Grandpa Arnold sprang up from his nap, took his whistle and blew two sharp notes back. That meant, "I'm coming."

And for the moment Mrs. Lady Beetle was forgotten, as Jo, Rosy and Aunt Dot dashed off through the woods after him.

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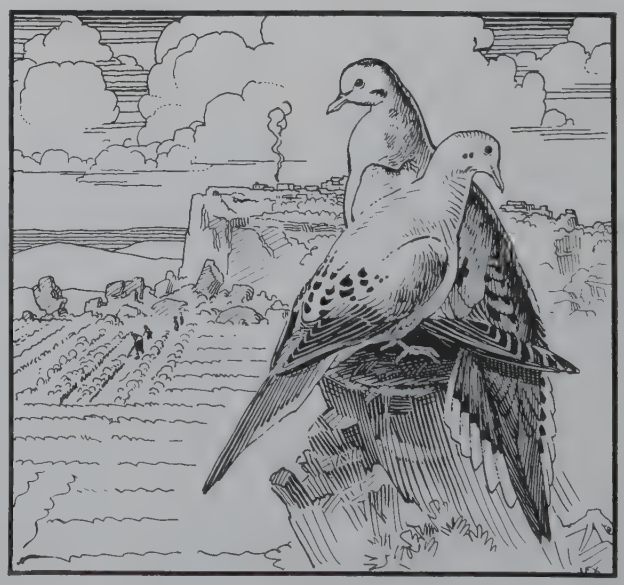
The Two Little Doves and the Drought

(*A Picurís Pueblo Indian Myth*)

Retold by DOROTHY E. PLETCHER

ONCE upon a time there lived two little Doves in the town of Picurís, in the land of the Pueblo Indians. Some of the Picurís boys went hunting every day. Each night they would come home carrying beautiful deer that they had killed. But the two little Doves did nothing but plant their crops every year.



Many moons passed. That is the Indians' way of saying how much time has gone by. Every day the little Doves sang in the fields as they hoed and worked over their corn and beans. But not once did they go hunting for food.

Alas! a year came when the crops of the little Doves were drying up. There was no rain. What would happen to their food? Then they decided to ask the Buzzard to call the rain for them. But the Buzzard only answered, "Why do you ask me to do this when I'm having a lovely time out in the heat? And, anyway, I don't like the rain because the Sun is my father."

Next they asked the Crow to help them. But he only answered, "Why do you bring me here from the mountains where I enjoy myself so much sitting in the shade? And beside, if I called the rain, it would wet my wings and I couldn't fly."

Finally the two little Doves decided to go to the top of Morning Mountain where Morning Star Boy lived, and ask his help. "If you would only call the rain for us," they told Morning Star Boy, "it would save our crops from drying up."

How happy they were when he replied, "Yes, I will call the rain for you." As the little Doves were hurrying home a few drops of rain began to fall. Soon it rained very hard. Their corn and beans began to grow.

"These crops," said the two little Doves, "that we have we will give to the Picurís people, so that they will not do so much hunting and kill so many deer; so that they may learn to work." And with this they flew away. From that time on the Picurís people have made their living cultivating the crops of the two little Doves.

And this is why the people of Picurís grow crops every year. Now they do not have to kill so many deer to keep from starving, for they can save the corn and beans in their store-houses for the winter.

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A Modern Almanac

Donald Culross Peattie has achieved something new and something distinguished in the field of Nature writing in *An Almanac for Moderns*. It is a difficult book to review in the brief space available to us, and, at the same time, to give a true picture of its character. Mr. Peattie has taken the calendar, starting with the first day of Spring, and given us 365 word vignettes of Nature. Some of these are concerned with the time of year; some are little historical or philosophical observations of Nature interest. In fact, a distinct strain of philosophy runs through all, and in the majority we find thoughts and references of stimulating character. Mr. Peattie, quite obviously, has a prodigious background of reading and study in the field of biological thought, past and present. But, in this volume, he has brought it to us in a literary form of great charm. This is a book one might well keep on one's bedroom table to pick up each morning and read the little essay for the day. Such a practice could not fail to prime the mental motor and send us forth to the tasks of the day with a stimulant to the mind, something sorely needed in a day of sheeplike thinking. Thank you, Mr. Peattie, and, also, G. P. Putnam for publishing this. It is yours, reader, for three dollars.

For the Herb Garden

Growing in popularity is the herb garden, and many are turning to old literature on the subject and finding it fascinating. Recognizing the trend, Helen Lyman has brought out a little booklet entitled *Thirty Herbs Will Make An Herb Garden*. The title is only in part descriptive of the contents of the booklet, because it includes several recipes for the use of these herbs to tickle the appetite. The booklet is available from the author at 52 Santa Clara Ave., Oakland, California, at twenty-five cents a copy.

For Garden Makers

Gardens, like skyscrapers, should be built according to plan. Too often amateur gardeners realize this too late. They would not go astray if they provided themselves with a copy of *Everyman's Garden* by Max Schling. In this volume this noted horticulturist starts from the very sub-soil of the garden and points the way. It reflects years of experience refined into a single compact book of distinct horticultural value and interest. The publishers are Macmillan and the price of the book is two dollars.

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Vainly each year, reports Mrs. Thomas S. King of Bristol, Virginia, she has tried to add to her winter bouquet the "last row" of the wing seed of the tulip tree, spread out in beautiful, flower-like form. Always the seeds would sail away, tantalizing, until one day she carried some iron glue and a brush with her. Applying a few drops of glue at the point where the seeds are attached to the base of the cone, she let this harden. Now she has permanent seed blossoms of rare decorative beauty. Mrs. King passes this tip on for the benefit of others.

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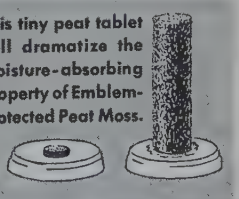

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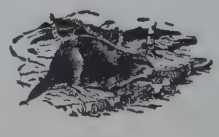

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(Continued from page 285)

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That splendid dictionary of gardening and general horticulture by L. H. and Ethel Zoe Bailey has been brought out in a new edition with supplement. This last contains more than one hundred pages, bringing this volume up to date. Revisions have also been made in the main text. Macmillan has published this and the price is five dollars.

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Photographic Notes

BY SAMUEL BROWN

The photographic section of NATURE MAGAZINE is designed to be of service to its readers interested in photography, in particular Nature photography. All are invited to submit any problems or questions, which will be handled with dispatch. Any suggestions with respect to the conduct of this department will be welcomed by the editor.

It is hardly necessary to point out Nature picture opportunities during June. Flowers come out in their full bloom and beauty; woodland and other scenes are especially attractive; small birds and animals become unusually busy and may be photographed at many interesting activities.

Insects are abundant. These are interesting and, for the owner of reflex and double extension cameras, a simple matter to photograph. No insects are very large and therefore a picture of them, to be of any value, must be either life-size or capable of being enlarged. The big problem is to be able to work under conditions which will permit a small stop to be used (to give critical definition) and to give a fast enough exposure to stop motion. Special emphasis must be placed on the need for sharpness as the whole value of the result lies in observing this point.

Life history and action pictures of field and water insects present individual problems in photographing. The rapidity with which they move, their color, surroundings and size are important factors that must be taken into consideration before making the exposure.

CECROPIA LARVA PICTURE TAKEN ON SUPER-SENSITIVE PANCHROMATIC FILM, F. 11, 1/10 SECOND EXPOSURE

The most valuable action pictures are those showing the subject engaged in feeding, capturing prey, egg laying, in flight, etc. These pictures, however, are the most difficult to get. One method of obtaining these is to place the camera on a stand; set it for a small stop and a fast exposure (1/100 of a second if possible; no longer than 1/25) and snap. This method has the disadvantage of only being able to be used in full sunshine. When the light is not just right, use one or two mirrors to reflect the light to the proper position. I have often combined the two methods with excellent results.

Life history pictures of insects, showing the eggs, larvae and full-grown subjects, are simpler to photograph, but even these, in the advanced stages of development, become somewhat difficult. In the early stages, however, they present no really formidable problems since they move slowly and rest

CATERPILLAR MASS TAKEN ON SUPER-SENSITIVE PANCHROMATIC FILM, F. 11, 1/15 SECOND EXPOSURE

frequently. Focus the camera, and, with a small stop (F. 11 to F. 22), wait till the insect moves slowly. Give a fast bulb or 1/10 of a second exposure. This is generally sufficient even under adverse lighting conditions.

One thing which has proved of untold value on insect picture hunts is a small bottle of ether. The druggist will supply a one- or two-ounce vial for a few cents. This will prove a worthy investment. To anaesthetize the insect, hold it, for a few moments, in the neck of the bottle. The process is complete when the subject becomes motionless. Do not overdo it or they will die. Place the larvae in their natural surroundings and when they recover sufficiently to show movement, take the picture.

Always strive to have the surroundings in harmony with the subject. Also be certain of enough contrast to accentuate the insect itself. Another precaution to be observed is that the area covered by the camera be protected from the wind to avoid showing movement.

Another way to work with larvae is to focus the camera on a certain point on a blade of grass or a shrub and place the insect at that point. If it moves away, replace it. This may have to be repeated ten to twenty times and occasionally more, but experience has shown that the subject tires out after the first few times and remains still long enough to be photographed. Naturally, this applies only to slow-moving subjects such as caterpillars, beetles and locusts.

Where the subject to be photographed is one of the varieties of flies, wasps, butterflies and other fast-moving insects, the wisest procedure is to use the ether. As it recovers it assumes its natural attitude and this is the time to make the exposure. Study the natural position so that you can recognize it when your subject comes out of the anaesthetic.

The best film to use for photographing these subjects is *Super-Sensitive Panchromatic*. This film will make the most of the available light, and its extreme color sensitivity makes possible a more interesting and truer rendition, of greater value than if taken on any other type of film.

Owners of double lens cameras can utilize them for small work by purchasing a portrait attachment that slips over the regular lens, and permits working closely.

TRADE HINTS

Dufaycolor is the name given to the latest film taking pictures in natural colors. It is being sold in amateur rolls and professional sizes. In use, it requires no more knowledge than black and white exposures. Booklet describing the film, process, formulas and prices is available.

Expert Camera Operation Made Easy is a small 32-page booklet, into which has been condensed a wealth of photographic information. Some of the subjects covered are: what happens when you take a picture; how to expose; how to get sharpness and detail; how to focus; what the shutter does; all about lenses; depth of focus; etc., etc. This writer has secured a limited number of copies of this valuable booklet and will distribute them as long as they last. Write for your copy *now*. Don't forget the stamped, self-addressed envelope.

The Eastman Kodak Co., Rochester, N. Y. has announced some new cameras. The Kodaks Six-16 and Six-20. Each model has a choice of lens equipment; the Kodak Anastigmat F. 6.3 or Kodak Doublet. Prices range from $10.00 to $15.00 and are

CECROPIA MOTH TAKEN ON SUPER-SENSITIVE PANCHROMATIC FILM, F. 8, 1/25 SECOND EXPOSURE

worthy of attention. Literature from the manufacturers.

All who have any photographic problems or difficulties, or would like to have prints and negatives criticised are invited to correspond with the writer who will give his personal and prompt attention to each inquiry. Address the department editor and enclose a stamped, self-addressed envelope for reply. We wish all of our readers to take advantage of this service.

Cordially,
Samuel Brown

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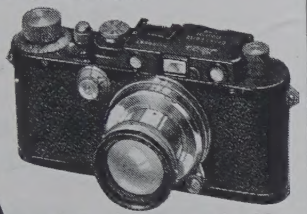

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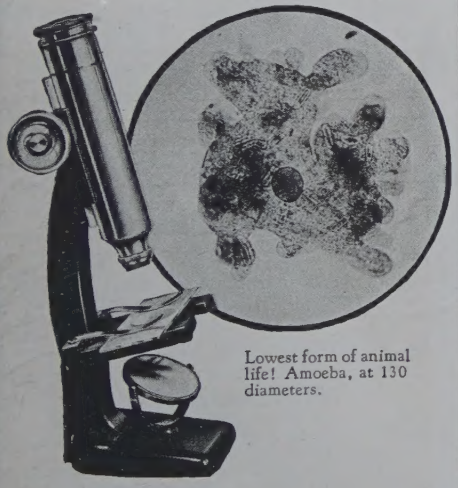

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TRACKING MICROCOSMIC GIANTS

(Continued from page 304)

for all the world like little scampering bugs. *Euplotes* is smaller, but has even larger and more complex cirri, which flicker about like tongues of flame. There is a band-shaped macronucleus and one contractile vacuole.

The final chapter in this study concerns the Order Peritrichida, with an array of bizarre forms that provide a fitting climax of excitement. Some are sessile, others free-swimming; some of the attached species are independent, others colonial; and there are naked examples as well as those with shells.

Vorticella, the Bell Animalcule, is perhaps best known. Each individual is like a small, inverted bell, displaying a prominent crown of cilia around the margin of the bell opening; these are in constant rotary motion, engaged in the ceaseless search for food particles to drive into the gullet. The apex of the bell, directed downward, is continued into a very long stalk by which the creature is attached, and the macronucleus is a prominent curved band. In Peritrichs, no cilia are present save those around the peristome.

Vorticella is *social,* numbers of individuals congregating and growing side by side, attached to some piece of vegetation or other object. As you observe one, he will take alarm at frequent intervals and contract violently and suddenly, the stalk coiling spirally like a watch spring. Then slowly he will uncoil and resume the erect posture, continuing his insatiable quest for smaller forms of life upon which to dine. *Carchesium, Zoothamnium* and *Epistylis* are similar, but *colonial,* the primary stalks branching repeatedly to bear numerous individuals.

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Here are a few of the best references for pursuing the subject in greater detail made possible by entire volumes:

Calkins, G. N., The Biology of the Protozoa. Philadelphia, 1926.

Kudo, R. R., Handbook of Protozoology. Springfield, 1931.

Stokes, A. C., Fresh-Water Infusoria of the United States. Journal of the Trenton Natural History Society, Vol. 1, No. 3, 1888.

Ward, H. B. & G. C. Whipple, Fresh-Water Biology. New York, 1918.

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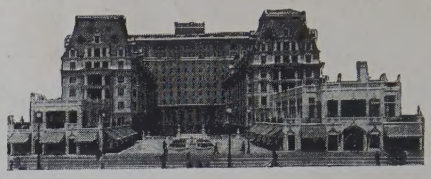

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